Electrical World

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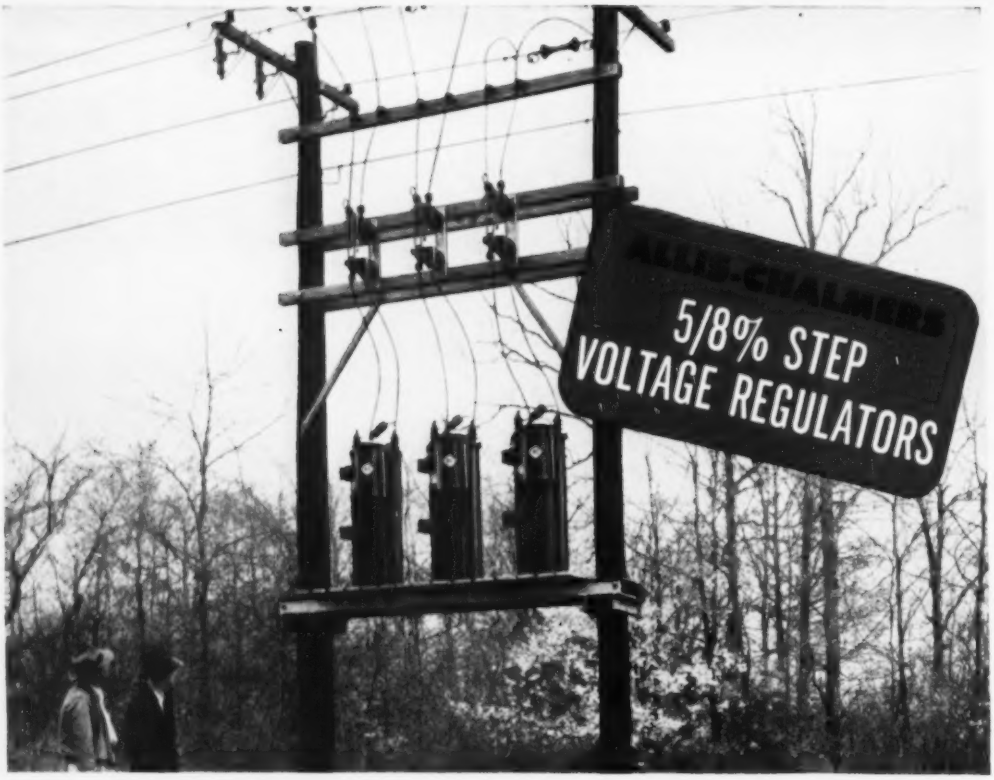


Get Voltage Regulation at Low Cost

With All 32-Step Regulator Advantages

HERE'S THE ANSWER to your voltage problems. Allis-Chalmers distribution regulators are low in cost. They are easy to install, simple to maintain. And they give *all* the advantages of Allis-Chalmers 5/8% step regulation: a narrow ± 1 volt band, 20% range of regulation, long-life contacts, and *Feather-Touch* control.

In addition, Allis-Chalmers distribution regulators have proved their reliability in eight years of field operation. Experience has also proved another major advantage: they are flexible. Their ease of installation and setting makes it easy to shift them from feeder to feeder.

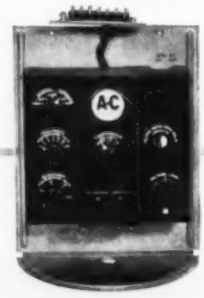
Get all the facts on these low cost units. Call your nearest A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3882

RATINGS AVAILABLE	7620 Volts—15, 50, 100 amp 5000 Volts—50, 100 amp 2500 Volts—100, 200 amp

Feather-Touch *Control Simplifies Installation*

There's just one adjustment to make when installing — set the calibrated voltage level. For more facts, write for Bulletin 01M7866-1.



ALLIS-CHALMERS

Originators of 5/8% Step Regulation

Models Can Be Fascinating

To a little boy (and some big ones, too) the models of power plant equipment made by Pennsylvania Power & Light Co are irresistibly fascinating. They even fascinate Walter B. Morton, left, the company's station electrical engineer. You'll see why if you read his article on page 92.

J. Graver, right, in charge of the company's model shop, is more than just a hobbyist. In his daily work he applies his training as an electrical engineer. He is quick to discover errors in design, to show how changes in construction would make operation safer, to suggest ways in which construction and maintenance costs can be cut. These contributions of Graver make the models fascinating elsewhere —in the offices of top management where efficiency, safety, and low costs never lose their attractiveness.

Far from City Streets

Perhaps it is because W. B. Elmer ("Street Lighting for Pedestrians," p. 96) sees so much of streets that he likes to get away from them. His "pride and joy" is his 60-acre farm in New Hampshire. Here he cultivates pine trees scientifically. For further relaxation he may do some charcoal portraits, a hobby that has stuck with him since he was art editor of the MIT "Voodoo."

In addition, Elmer has long been an amateur pianist. He's a two-piano man—take part in dual piano recitals. What's more he has served as church organist during a summer period.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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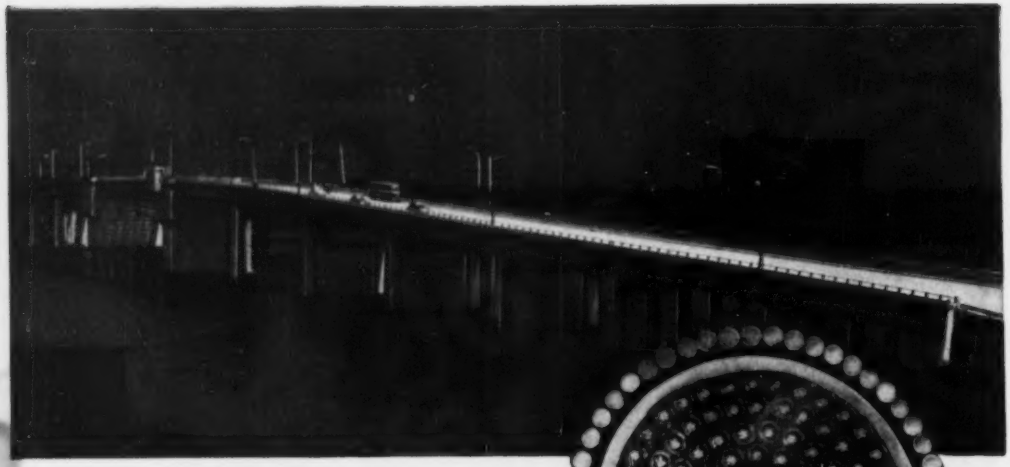
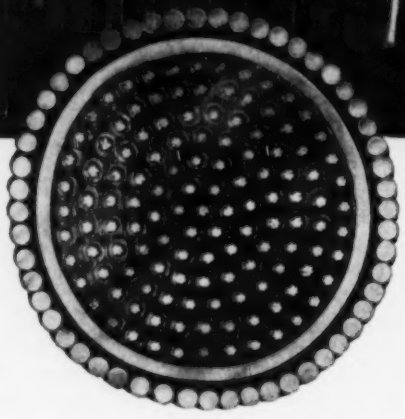


new ELIZABETH RIVER BRIDGE* features unusual OKONITE cable designs



Nearly 5 inches in diameter, this 127-conductor Okolite-Okoprene multi-purpose submarine cable contains circuits for power, control, lighting and signaling.

Just about everything but the traffic is energized through Okonite cables on the new Elizabeth River Bridge between Norfolk and Berkley, Virginia. Operating drives, brake motors, gates, pumps, lights and even electric heating units are equipped with cables designed by Okonite engineers in cooperation with J. E. Greiner Co., Consulting Engineers.

A multi-purpose submarine cable, trenched in below the river bed between the bascule piers, contains circuits for power, control, lighting and signals. This 127-conductor Okolite-Okoprene cable has a lead sheath of record diameter (4.1") and, in addition, has the further protection of a layer of jute and heavy steel armor wires.

Another unusual design is the 3-conductor Okolite-Okoprene cable for the navigation lights. This has a flexible bronze basket-weave armor to permit it to move with the fender piling and also protect it against continual salt spray.

These and other cables on this job illustrate how Okonite cables are engineered to meet the most unusual job requirements. When ordering cables for any application ask your Okonite representative to help you choose the one that is best suited for your needs. The Okonite Company, Passaic, N. J.

*Consulting Engineers
J. E. Greiner Company, Baltimore, Maryland

Contractors
Tidewater Construction Corporation, Norfolk, Virginia

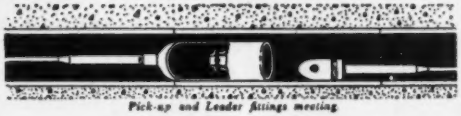
Electrical Subcontractors
Tuck & Kendall, Inc., Norfolk, Virginia

The best cable is your best policy

OKONITE OKONITE SINCE 1878 *insulated wires and cables*

Electroline Duct Rodding

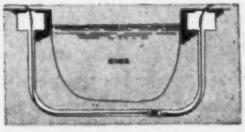
DOES IN THIRTY MINUTES
WHAT USED TO TAKE
TWO WEEKS



Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.



PATENT APPLIED FOR

Utilities have found that one gang, with Electroline Steel Duct-Rodding Equipment, can make a half-hour job out of one that formerly took two gangs two weeks with old-style equipment!

In consequence, they have made amazing savings in labor cost alone. Add to this lower first cost, the lower handling cost, and longer life . . . then you have their reason for adopting Electroline's speedy, economical Duct-Rodding Equipment.

The construction is simple and trouble-free, yet affords the outstanding advantages of easy, efficient rodding and great durability in service.

Originated by Electroline—Always Ahead of the Field. Write for bulletins.

Electroline Company

4121 South La Salle Street
Chicago 9, Illinois

OTHER Electroline PRODUCTS

Alduti Interrupter Switches

PERMIT ARC-FREE

The practice of mounting sectionalizing switches upright to provide arc clearance is often inconvenient and costly. This is especially true where a vertical conductor configuration is used. In this case, the transposition of conductors into the horizontal plane for pole top switching requires a longer span and a higher pole; and the wide spacing demanded by horn gap switches often results in a costly supporting structure.

On the other hand, with the installation of an Alduti Interrupter Switch vertical conductor configuration, regular span lengths and regular pole height can be retained. In many cases the installation can be **made on an existing line pole,** and no **switch supporting structure other than the pole itself is needed.**

Because Alduti Interrupter Switches operate without external arcing there is no limitation imposed on line design to provide arcing clearance for switches. Switch configuration can conform to the configuration of the line. This opens the door to development of "unconventional" improvements in switch mounting techniques, of which the illustration is a typical example.

Yet these structural advantages are but part of the story. With interrupter switches you are no longer restricted to present sectionalizing practices. Feeders and branch lines can now be safely switched without sequencing with breakers or dropping individual loads —because Alduti Interrupter Switches interrupt not only line or cable charging currents, **but also 600 amperes of load current.**

Why not discuss with your S&C sales representative the advantages of this new kind of sectionalizing switching.

Alduti Interrupter Switches are supplied in the following ratings:

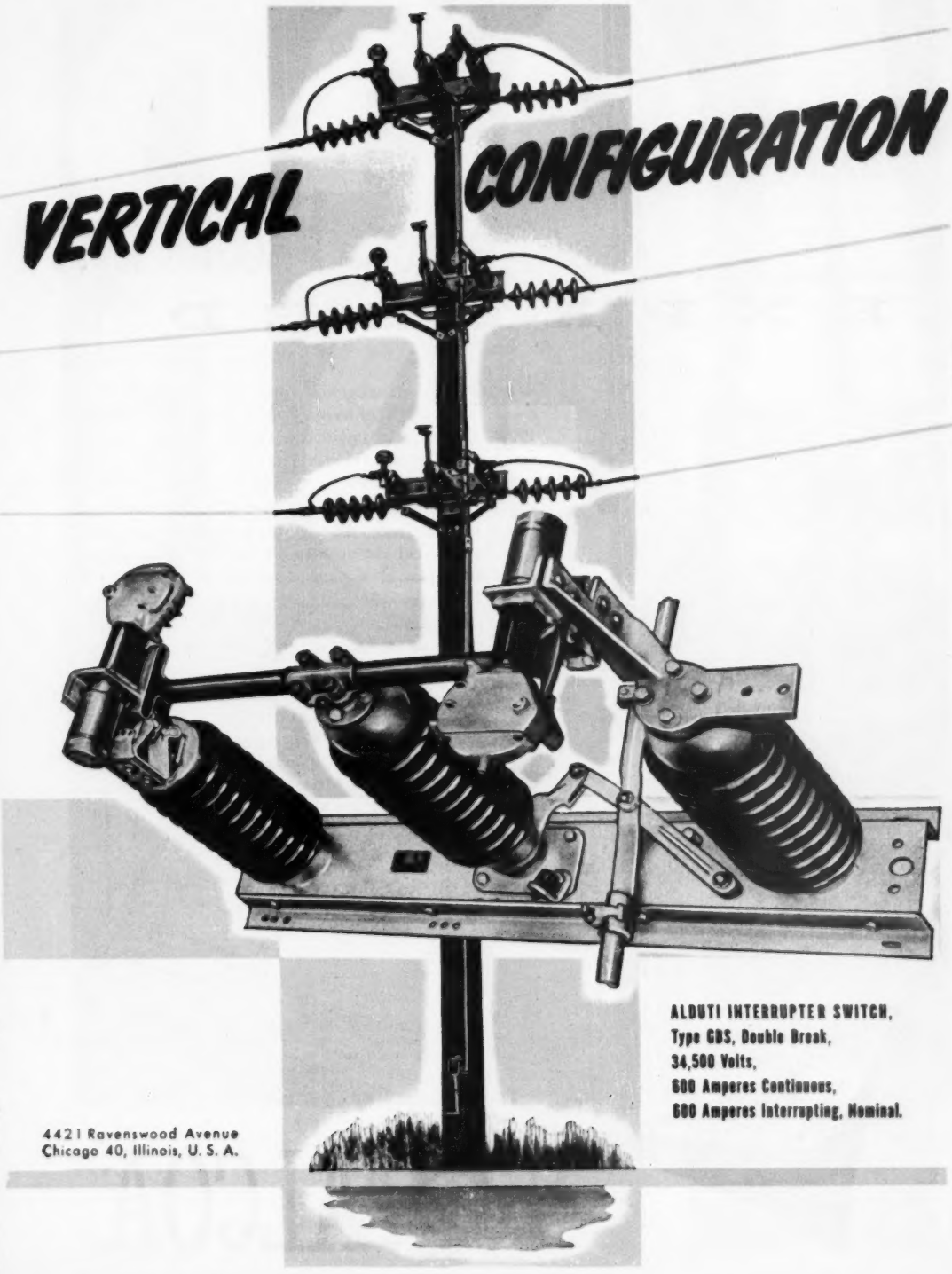
Volts	Amperes Continuous	Amperes Interrupting, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

Formerly SCHWEITZER & CONRAD, INC.

In Canada, Powerlite Devices, Limited, Toronto

VERTICAL CONFIGURATION

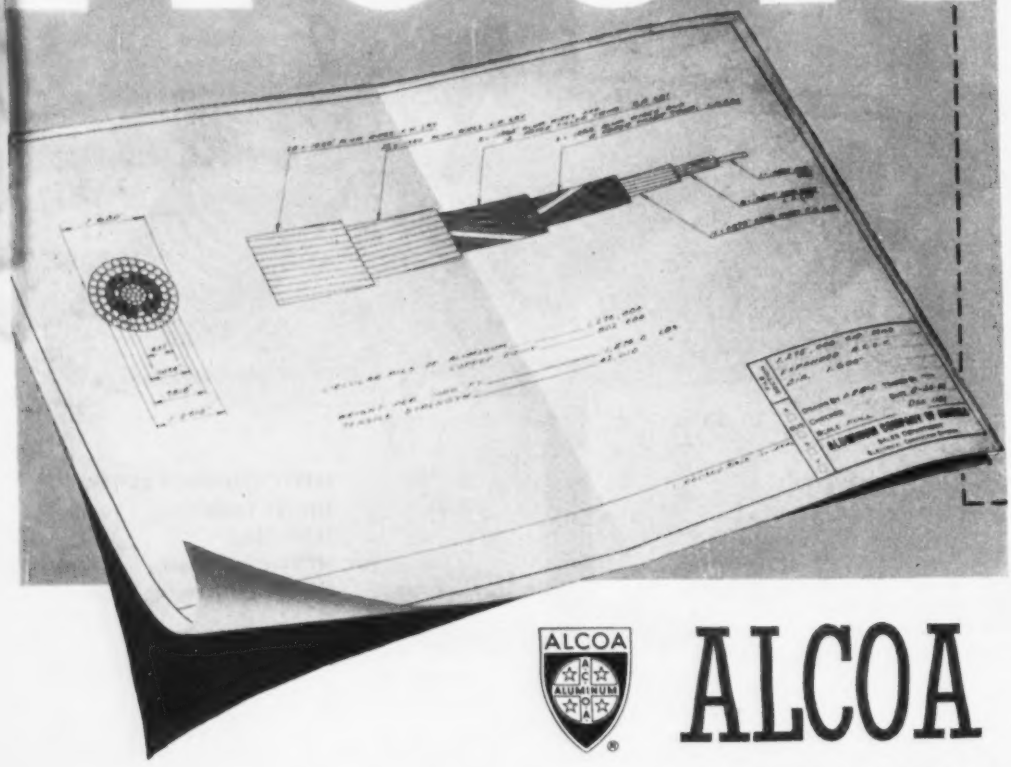


ALDUTI INTERRUPTER SWITCH,
Type GBS, Double Break,
34,500 Volts,
600 Amperes Continuous,
600 Amperes Interrupting, Nominal.

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

ACSR

EXPANDED



ALCOA

ALCOA

and Alcoa Leadership

Conductor for the highest voltage transmission line in America has been manufactured by Alcoa. Nearly two million pounds of 1.6-inch diameter expanded ACSR have been delivered and erected in West Virginia. This line will operate at 315,000 to 330,000 volts.

Expanded ACSR is designed to provide economically the large diameters required for conductors at super-voltages. The customary relationship between strength and loaded weight of conductor is maintained. The increased diameter of Alcoa expanded ACSR is thriftily obtained by introducing strands of processed paper twine in the intermediate layers of the cable.

Alcoa's introduction of expanded ACSR comes after twenty years of development and testing. It is the product of the same painstaking research, engineering, and manufacturing standards which have made Alcoa first in aluminum conductor. It is the latest of many developments that have established Alcoa's leadership in wire and cable, aluminum and ACSR.

Alcoa leads in quality, too, for Alcoa ACSR comes in but one grade—the best. The uniformly correct stranding, the high-quality galvanized steel core are evidence of this quality.

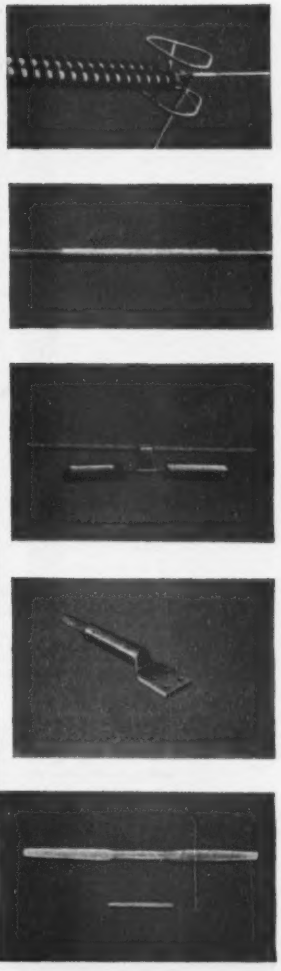
Look to Alcoa for leadership . . . first with the best in aluminum.

"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.

ALCOA ACCESSORIES

Alcoa offers a complete line of job-proven accessories for aluminum cable and ACSR.

ALUMINUM COMPANY OF AMERICA
2100-L Gulf Bldg. • Pittsburgh 19, Pa.



FIRST IN ALUMINUM FIRST IN A·C·S·R

Look for this trademark-
Life Span
It's your assurance of added years of trouble-free service
LIFE-SPAN
WESTERN RED CEDAR POLES
Trade Marks Distinguish!
When you see the trade name "Life-Span" permanently branded into the side of a power-line pole, you see the stamp of QUALITY and longer service life. LIFE-SPAN Western Red Cedar Poles are straight, strong, safe and clean—decay resistant from top to butt. Once installed they are set for many, many years of trouble-free service.
Write any of the dealers listed.
SOLD ONLY BY THE FOLLOWING:
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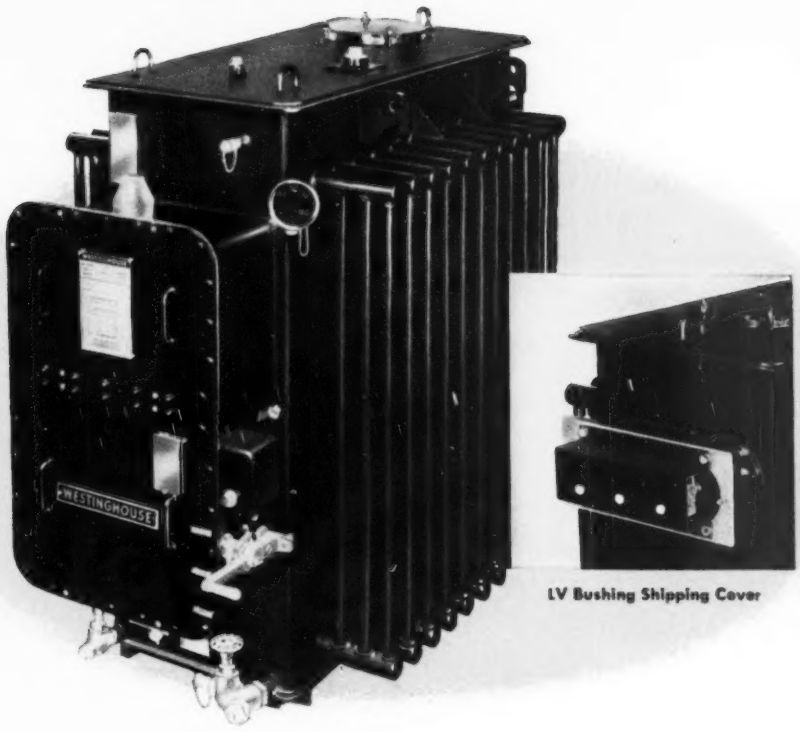
50 Church St., New York, N.Y.
B. J. Carney & Co.
Spokane—Minneapolis
Schaefer-Hitchcock Co.
Sandpoint, Idaho
(Suppliers for Joslyn Mfg. & Supply Co.)
Naugle Pole & Tie Corp.
Chicago, Illinois
CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA



LV Bushing Shipping Cover

QUALITY in the transformer ADDS RELIABILITY to the network

Everyone agrees that when you install a network system, you install *the best* for reliability and service continuity.

But the degree of reliability...or, more exactly, the freedom from maintenance, depends directly on quality in the transformers.

That's why Westinghouse Network Transformers have continuously wound coils of sliverless copper, to guard against hot spots, crystallization and pricked or scored insulation. That's why they're high-frequency tested, too.

In addition, Westinghouse Transformers are filled under vacuum, and have welded-on covers to assure a perfect seal. Finishes are not only baked for longer life, but bases are undercoated.

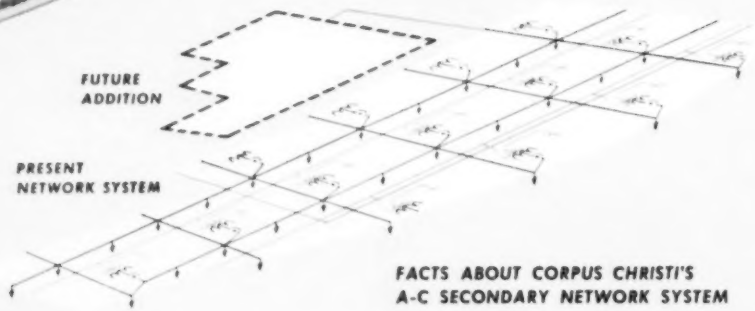
There are many other features such as the LV bushing shipping cover, shown above, that assure safe delivery of the quality built into Westinghouse Network Transformers. Your Westinghouse representative will be glad to give you full information, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70646

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK TRANSFORMERS

NETWORK SYSTEMS PAY... IN *Corpus Christi*



FACTS ABOUT CORPUS CHRISTI'S A-C SECONDARY NETWORK SYSTEM

The new network encompasses the area roughly below the Bluff from Mann Street to Born Street consisting of 43 blocks, (see large white area). The flexibility of the A-C Secondary Network System will permit the inclusion of 12 more blocks above the Bluff, (see dotted area). Thus far, the underground network system contains thirty-two subway-type network transformers and protectors and vaults.

Converting Growth Problems into Load Profits!

Rapid growth, including the construction of many new buildings and the addition of large loads such as air-conditioning units, brought the downtown overhead electric distribution system in Corpus Christi, Texas, to the practical limits of its expansion three years ago. Because of the unprecedented demand, the existing 2300-vol. overhead radial system proved inadequate. There are no alleys in downtown Corpus Christi; streets were cluttered with poles and wires. In some cases, several sets of secondary mains were involved on the same street. Voltage regulation and service continuity problems were acute.

CAREFUL SYSTEM PLANNING by Central Power and Light Company indicated an underground network, supplied by a higher primary voltage, as the desirable long-term solution. In 1949 they embarked on a three-year program, installing a 12,480-volt primary. Four underground feeders were brought in from the Nueces Bay Power Plant to the new, downtown, A-C Secondary Network System. Because of tidewater conditions, this 43-block area presented serious construction and operation problems. The transformers are subway type, 500 kva, 3 phase, with throat-mounted submersible, 1600-ampere, 125/216-volt network protectors.

CENTRAL POWER AND LIGHT COMPANY now is able to provide customers with uninterrupted power supply . . . previous problems and unsightly pole lines have disappeared! The network system has proved as practical and economical as anticipated. In short, Corpus Christi has solved future load-growth problems . . . the utility now is ready to more economically serve its increasing load.

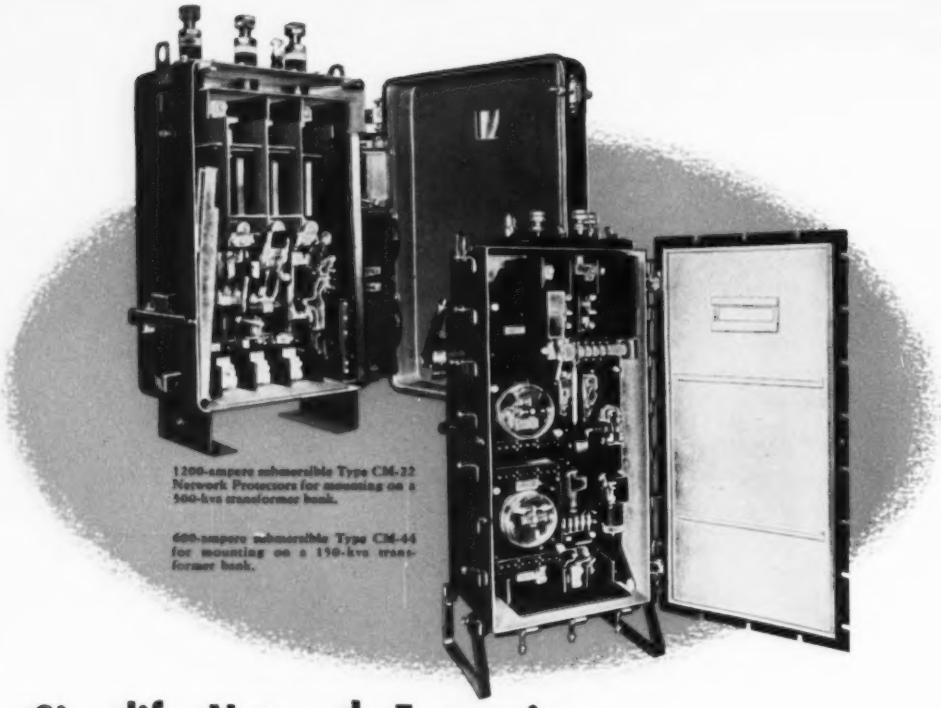
THE RANGE OF WESTINGHOUSE NETWORK EQUIPMENT enables you to employ the type of network system that best suits your future needs. Booklet B-4002, "A-C Secondary Network Systems", contains complete information about the flexibility and many advantages of this system. Our engineers are ready to help you in your network system planning. Call your nearby Westinghouse office, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-97158

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK EQUIPMENT



1200-ampere submersible Type CM-22 Network Protectors for mounting on a 500-kva transformer bank.

600-ampere submersible Type CM-44 for mounting on a 150-kva transformer bank.

Simplify Network Expansion with Westinghouse NETWORK PROTECTORS

You can expand your network system simply—and economically—with Westinghouse Network Protectors. The reason—Westinghouse heavy-duty and medium-duty protector use the same relays. Hence, as load grows medium-duty (CM-44) protectors can be replaced with heavy-duty (CM-22) protectors and suitable transformers—*without upsetting system co-ordination!* CM-44 units may then be moved to lighter load areas.

Keep this important Westinghouse feature in mind as YOU plan your network system. It's a *sure* way to provide for simple, low-cost expansion of that system when load conditions dictate.

Ask your Westinghouse representative for further information . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60778

ONLY WESTINGHOUSE NETWORK RELAYS . . .

- Eliminate gears that cause friction and wear.
- Have a sensitive reverse-current setting that can be varied from .1% to 10% of the network protector rating.
- Have bearing surfaces readily accessible for inspection and cleaning.
- Have relay terminal screws that eliminate the need for additional testing facilities in the control wiring.
- Provide a nonsensitive relay that permits sensitive tripping after a time-delay.

YOU CAN BE SURE... IF IT'S
Westinghouse
NETWORK PROTECTORS

Save copper with
CHASE BUS CONDUCTORS

You can cut your copper requirements for bus conductors up to 36% by using Chase ventilated square copper tube bus conductors, instead of rectangular flat bars.

Chase square copper tube buses can withstand heavy short circuit stresses because of their high mechanical strength. The large cross-sectional areas permit longer spans between supports without unduly large sags.

They have high thermal conductivity and low resistance voltage drop and power loss per pound of metal. Send for the Chase Copper Bus Conductor Handbook giving specifications and installation data.

Chase BRASS & COPPER

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• *The Nation's Headquarters for Brass & Copper*

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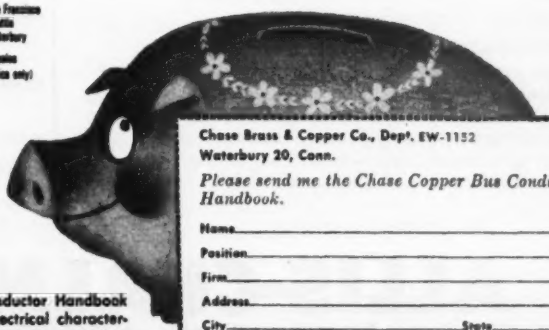


Chase Brass & Copper Co., Dept. EW-1132
Waterbury 20, Conn.

Please send me the Chase Copper Bus Conductor Handbook.

Name_____

Position_____

Firm_____

Address_____

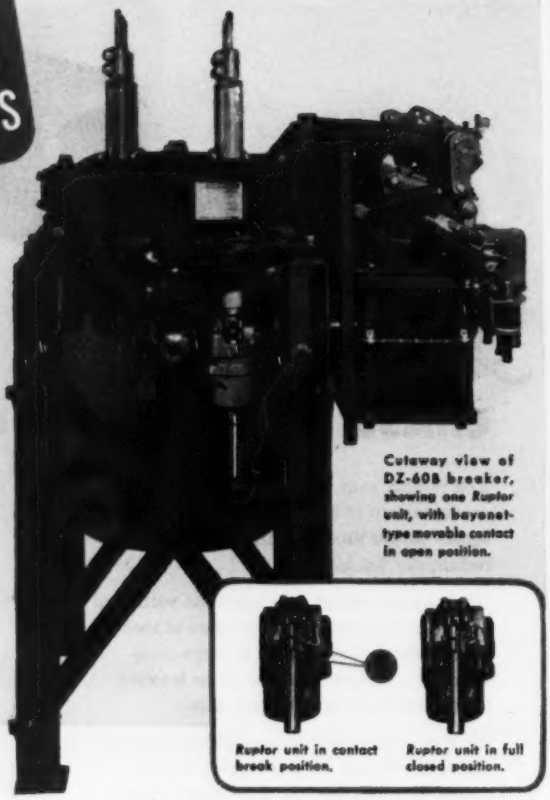
City_____ State_____

FREE Chase Bus Conductor Handbook gives physical and electrical characteristics as well as data on copper saving.

ALLIS-CHALMERS

Oil Circuit Breakers

CHECK THIS "Inside Story"



Cutaway view of DZ-60B breaker, showing one *Ruptor* unit, with bayonet-type movable contact in open position.

Ruptor unit in contact break position.

Ruptor unit in full closed position.

A LOOK INSIDE shows why years of dependable protection are assured with an Allis-Chalmers DZ breaker. Within the rugged frame and tank are time-proved *Ruptor* interrupting devices—which have their contacts controlled by a mechanically trip-free solenoid-operating mechanism. *Ruptor* units provide long periods of continuous, trouble-free service because they offer:

SIMPLE DESIGN: Bayonet contacts (1) are the only moving parts.

EASY INSPECTION: Drop the tank, and the bayonet contacts are visible in open position. For access to the stationary contacts, remove four bolts and cylindrical shell (2).

DEPENDABLE OPERATION: Tulip and bayonet type contacts (3) are self-aligning and self-cleaning; they maintain high conductivity without readjustment. Efficient interruption on special arcing-alloy contacts within oil-filled *Ruptor* unit minimizes arc energy—contributing to long contact life and low oil deterioration.

Ruptor is an Allis-Chalmers trademark.

Allis-Chalmers circuit breakers are available in ratings from 2.5 to 230 kv, with interrupting capacities from 15,000 to 10,000,000 kva, to meet all industrial and power company requirements. For more information, call your nearby A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3825

TYPE	RATED KV	MINIMUM KV AT RATED KVA	RATED AMPS	KVA INT. CAPACITY
DZ-40B*	7.2	2.3	600	100,000
			1200	100,000
			2000	100,000
DZ-60B†	13.8	4.0	600	150,000
			1200	150,000
DZ-100B†	13.8	4.0	1200	250,000
DZ-200B†	13.8	6.6	1200	500,000
			2000	500,000

*Ask for Bulletin 7186179.
†Ask for Bulletin 7186129.

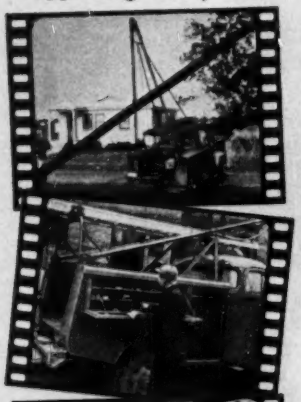
ALLIS-CHALMERS

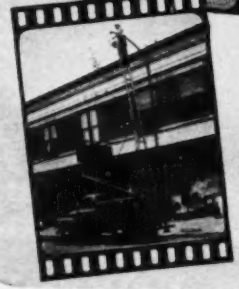
Electrical Protection *Depends* on Mechanical Perfection

Action!

This Versatile Body is the STAR OF THE FIELD

A leading performer in supporting roles, too!





POWERS *American*

Series 350

LIGHT DUTY MAINTENANCE BODY

Utilities everywhere award the Series 350 an "Oscar" for efficiency. This versatile unit enables a two-man crew to perform maintenance and installation work normally requiring additional men and vehicles. The compact, fold-over derrick sets 40′ poles—a job which would otherwise require costly heavy-duty equipment. There's a 24′ ladder which can be quickly erected for overhead work. Compartments are equipped to carry tools and materials for many service operations. The under-floor winch is always ready to use—without moving material load. No wonder the Series 350 has been acclaimed "the most versatile performer in the field."

more utilities use POWERS-AMERICAN bodies than any other make

CLIP THIS COUPON and attach to your letterhead

McCABE-POWERS AUTO BODY COMPANY, 3901 N. Broadway, St. Louis 15, Mo.
Please forward details on SERIES 350. *Also send information on the following:*

- ☐ LINE CONSTRUCTION BODIES
- ☐ GENERAL SERVICE BODIES
- ☐ REVOLVING AERIAL LADDERS
- ☐ WIRE REELS
- ☐ POLE TRAILERS
- ☐ HYDRAULIC TOWERS
- ☐ _____
- ☐ _____
- ☐ _____

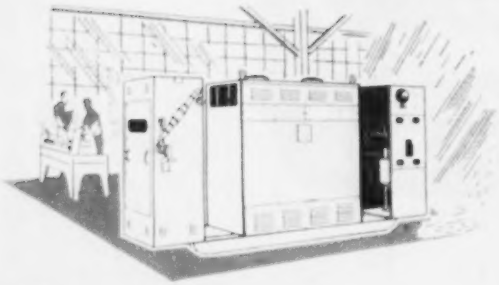
Name _____

Company _____

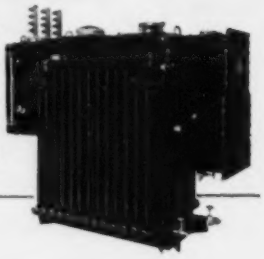
Address _____

City _____ Zone _____ State _____

custom-built transformers

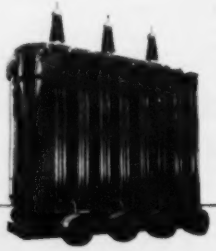


When custom design is a factor . . .



Askarel filled subway type network transformer, 500 KVA, 12480 to 216Y/125 volts, 3-phase, 60-cycle, complete with high voltage disconnect and grounding switch, low voltage network protector, and electrical interlocks.

Dry type air-cooled, load center transformer, 225 KVA, 3-phase, 60-cycle, 2400 to 120/208Y volts. Gang operated oil-fused cutouts are included with operating handle which is accessible through door in end of cabinet.



Power transformer, 10,000/12,500 KVA, 3-phase, 50-cycle, voltage 69,000Y to 13,200Y, with tertiary winding of 3500 KVA, air blast equipment for supplemental rating, low voltage terminal chamber and wheels.

TRANSFORMERS are the only product The Standard Transformer Company builds . . . the most important part of the load center. You thus have complete freedom in your choice of accessory equipment.

Specify the type and make of switchgear you prefer . . . STANDARD will quickly produce a complete, well-integrated unit, exactly designed to the proper dimensions and arranged according to your requirements.

As STANDARD has specialized in transformer design and application for more than 30 years, unusual assemblies are usual with us. You write your own ticket.

Whether unit installations are required for indoor, outdoor or underground, STANDARD will meet your most exacting requirements and include accessory equipment made by the supplier you prefer.

Write today for specific information.

Everything points to . .

WRITE FOR BULLETIN CL-50

See and read about actual transformer installation on the job around the world . . . evidence that your confidence in STANDARD is well placed.

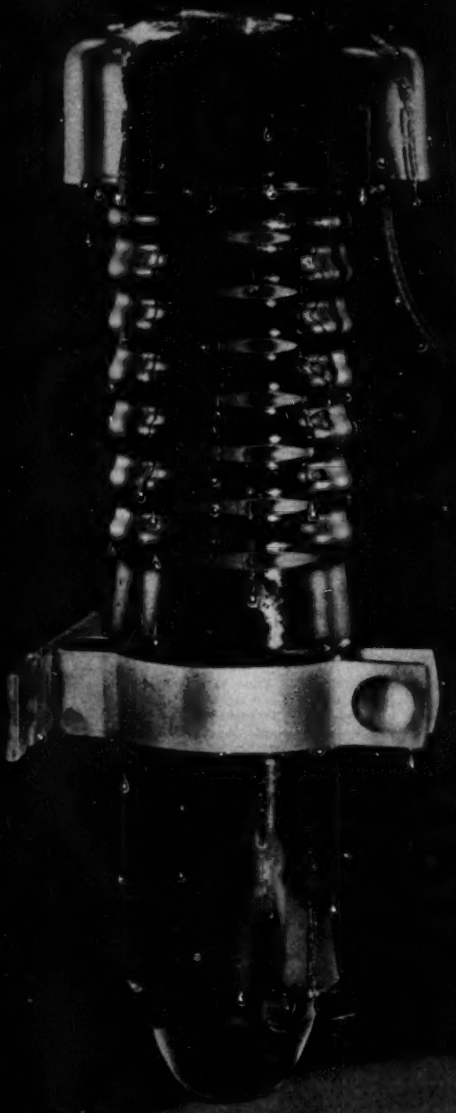
Standard

Trade Mark ®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES



THE ARRESTER THAT *Moisture* DOES NOT HARM

Crystal Valves Are

Moisture-Proof, Corrosion-Free

The moisture proofing of Crystal Valve Lightning Arresters is another reason for their superior service and long life, even under the wettest conditions.

A closed end solid brass coupling carries the line lead to a gasketed copper cap which hermetically seals the top of the arrester. This assembly is covered by a porcelain cap attached by means of a non-cracking high melting-point plastic compound. A duplex seal closes the ground end; this seal is further protected by a porcelain petticoat which is part of the porcelain body.

Whether you prefer the ventilated spark gap type or the hermetically sealed unit, Crystal Valves' outstanding moisture-proof qualities assure you of dependable lightning protection . . . under all operating conditions . . . throughout their long, trouble-free life.

Write today for the complete Crystal Valve Arrester Catalog

CRYSTAL VALVE

LIGHTNING ARRESTERS

ELECTRIC SERVICE MANUFACTURING CO., PHILADELPHIA 32, PA.

Represented in Canada by Lyman Tube and Bearing, Ltd., Montreal and Toronto

–for every wiring need!

Specify ACCURATE TAPES

ACCURATE FRICTION TAPE

Features the best of material carefully fabricated to provide maximum mechanical protection. Available in Standard and A.S.T.M. grades.

ACCURATE RUBBER TAPE

Offers high elasticity, high dielectric strength and super aging qualities. Made in both Standard grade and A.S.T.M. – A.A.R. Specification

ACCURATE PLASTIC TAPE

Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.

MEMO TO
electrical men!
It's easier and faster with ACCURATE TAPES
Best from all angles — that's Accurate tape. Faster applying because of super workability and cohesion. No heat or pressure, required for Accurate Rubber Tape, either. Try Accurate on your next job.

for the electrical industry are manufactured to precision standards by men who have devoted a lifetime to producing tapes of superior quality. Every foot is carefully made and constantly inspected to assure uniform high quality. The sure way to complete tape satisfaction is to specify ACCURATE by name — every time. Get all the facts on ACCURATE Tape now! Just call or write the Accurate Manufacturing Company, Garfield, New Jersey, for new illustrated literature which includes complete specifications and technical data covering the entire ACCURATE line of quality tapes. There is no obligation.

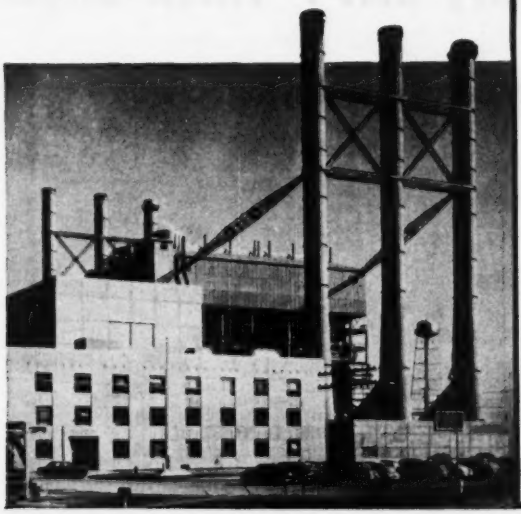
ACCURATE your best buy in tape

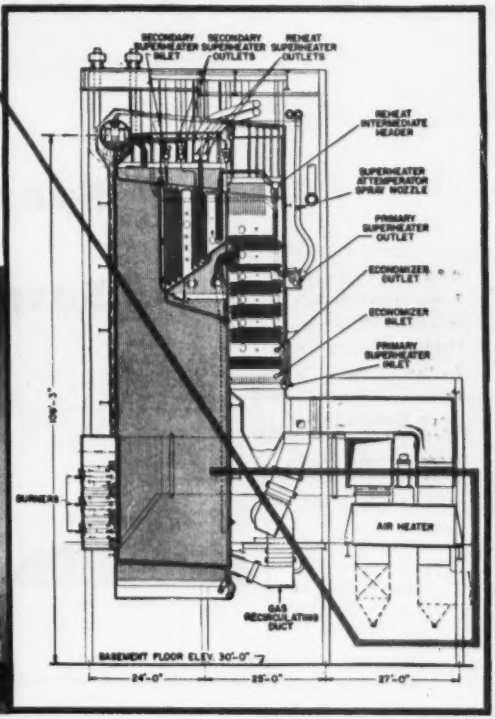
MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

All Boilers at Moss Landing Steam Plant of the Pacific Gas and Electric Company

equipped with

LJUNGSTROM AIR PREHEATERS





In the country's largest single utility expansion program, costing more than one billion dollars, Pacific Gas and Electric Company is boosting its power capacity by more than 2,500,000 kilowatts. One of the five steam power plants in this program is P. G. and E.'s Moss Landing Steam Plant, designed and constructed by Stone & Webster Engineering Corporation, under the supervision of the P. G. and E. Engineering Department.

Three of a projected five 100,000-kw turbines are in operation now at Moss Landing. Steam for each of these three turbines is supplied by two 475,000 pounds of steam per hour Babcock & Wilcox Radiant Boilers with superheater outlet conditions of 1405 psi and 950 F. The two turbines yet to be installed will each be powered by one B&W reheat boiler (illustrated), designed to generate 850,000 lb of steam per hr at 1450 psi and 1000 F, reheated to 1000 F.

Each of the boilers at Moss Landing has been designed to incorporate a Ljungstrom Air Preheater. Those now in use preheat incoming air to 575 F, and cool exit gases to 350 F. Ljungstroms will be used also for the boilers being built.

Moss Landing is another in a long series of new stations and expansions to existing stations where Ljungstrom Air Preheaters have been specified for high-performance steam generating units. The unanimity with which the Ljungstrom has been accepted by boiler manufacturers, consulting engineers, and power companies is demonstrated by the fact that over 285,000,000 pounds per hour of steam capacity since 1945 has been served by Ljungstrom Air Preheaters.

THE Air Preheater Corporation 60 East 42nd St., New York 17, N. Y.

INEXPERIENCED CONSTRUCTION CREWS?

Specify LAPP Thick-Shell Suspension Insulators

M & E Strength, lbs.	13000
Routine Tension Test, lbs.	6000
Impact Strength, inch-lbs.	90
Leakage Distance, inches	11
Dry Flashover Voltage	80000
Wet Flashover Voltage	50000
Impulse Flashover Voltage, Pos. 1.5 x 40	125000
Impulse Flashover Voltage, Neg. 1.5 x 40	130000

● Are your suspension lines being built by contractors, or by inexperienced men in your own crews who think that bouncing suspension discs off the concrete highway is proper handling? The Lapp Thick-Shell Suspension unit has a full two pounds more of porcelain than standard, by specification has more than 60% extra impact strength. At a small premium in price, is good insurance against rough handling. And where attack by stones and bullets is likely, they may save your line!

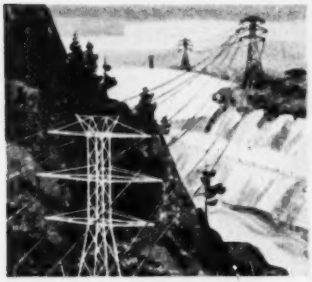
Lapp

LAPP INSULATOR COMPANY, INC., LEROY, NEW YORK

ADVERTISEMENT

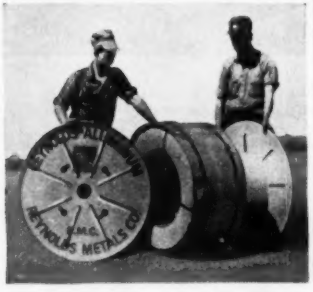
Electrical Applications of Aluminum

Aluminum Cable Steel Reinforced

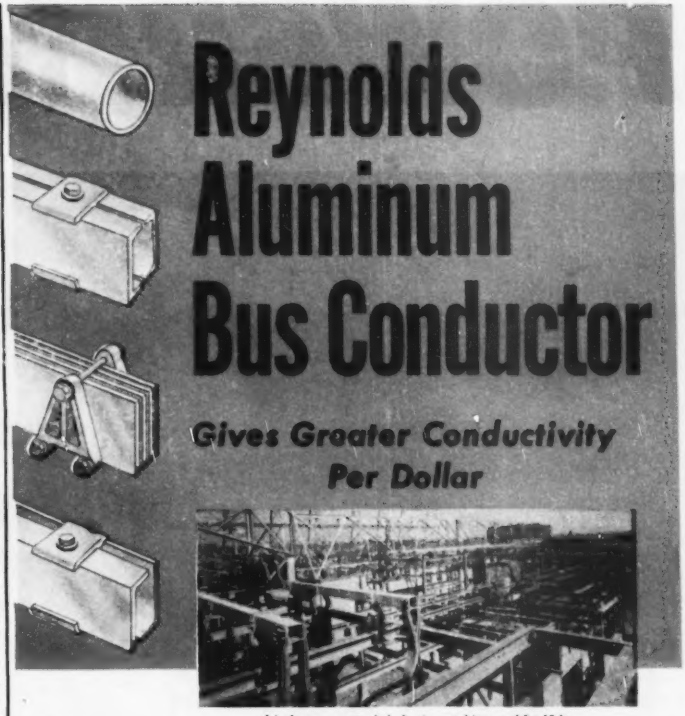


Worthwhile savings are yours with Reynolds ACSR because the initial price of this steel reinforced aluminum cable is less and you save through reduced handling and field costs. For example, men and equipment are handling 20% less weight with Reynolds ACSR. Easier, faster stringing is bound to result. ACSR is light yet strong—you can go to longer distances between poles—save up to four poles per mile. Or, because there is less sag to ACSR—you can use shorter poles or towers. Reynolds offers engineers a free ACSR manual with full information on line design and erection . . . sag-tension charts, staking tables, stringing-sag tables, etc. Please request on your business letterhead.

Master Reel and Coil Service



Reynolds offers a Master Reel and Coil Service that goes hand-in-hand with Reynolds ACSR toward saving important time, money and labor. Reynolds all metal Master Reels sharply decrease handling, storage and bookkeeping costs. Four Master Reels actually take the place of one hundred wooden reels. They're easily taken apart and re-assembled around the Master Coil by linemen in the field. Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. They're carefully waterproofed, lagged and banded for complete protection in transit and on the job. For further details, write Reynolds Metals Company or see one of these Reynolds distributors: Westinghouse Electric Supply Co., New York, New York (And branches) • Griffin Manufacturing Co., Dallas, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • Hughes Electric Supply, Orlando, Fla. • Maydwell & Hartzell, Inc., San Francisco, Calif. • Power Line Equipment Co., Wichita, Kans.



Reynolds Aluminum Bus Conductor

Gives Greater Conductivity Per Dollar

6 inch square extruded aluminum tubing used for 13 kv, 4,000 ampere conductor in generating station.

Bus conductor made of Reynolds Aluminum costs less than conductor made of other metals—gives you *more* conductivity per dollar. Aluminum bus conductor assures other economies, too, because its lighter weight permits greater span lengths, reduces floor loads, allows faster, easier handling and saves on erection time and labor costs.

Aluminum bus conductor in form of rectangular bars, channels, angles, special extruded shapes and tubing is finding widespread application in utility generating plants and substations, in industrial installations and packaged power control and distribution units. For most uses, past technical problems have all been solved. So, before you plan your next job, consider these characteristics of aluminum: lower cost, high electrical conductivity, light weight with high strength, excellent resistance to corrosion, ease of fabrication, plus other factors favorable to individual applications.

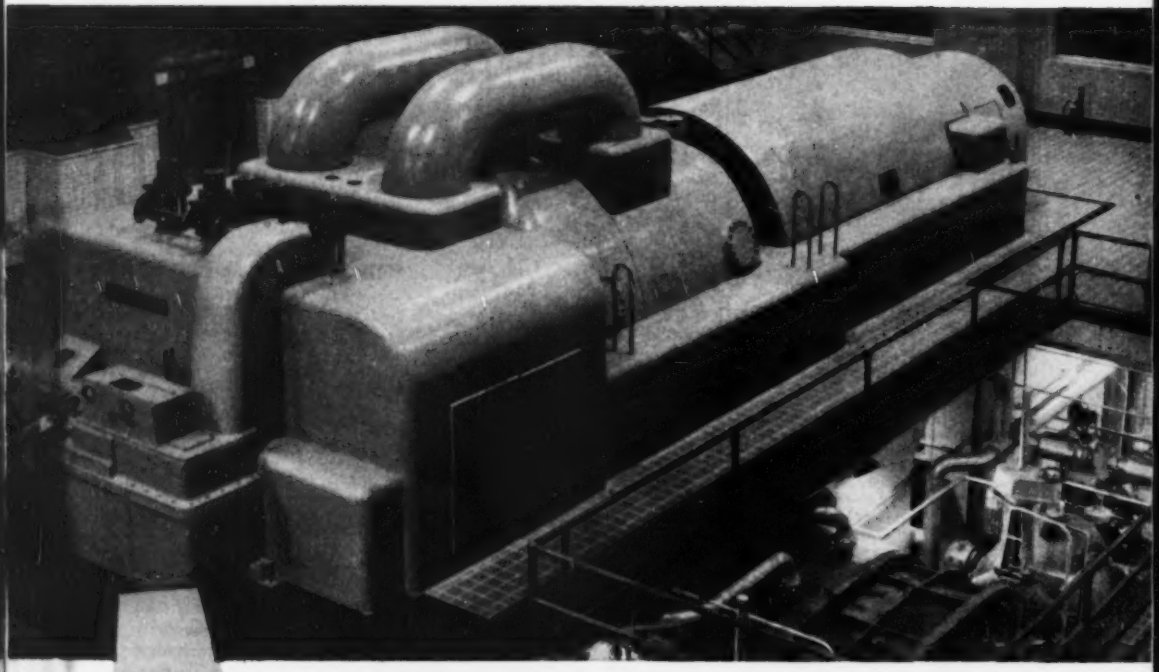
Sooner or later you'll use aluminum—why not now? Start by sending for a copy of AIEE conference paper, Drawn and Extruded Aluminum Products in Relation to the Electrical Industry. For design assistance on your specific applications call on Reynolds Aluminum technical specialists. *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.*

Remember—Reynolds technical assistance is always available.

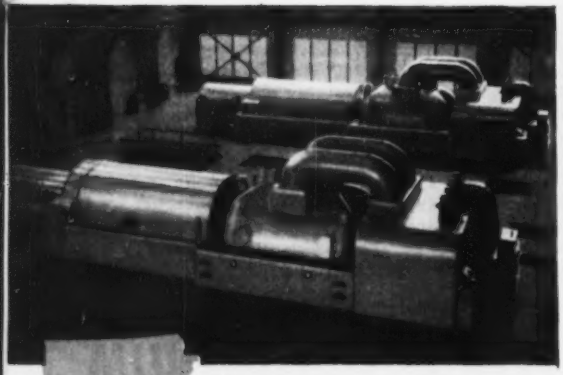
REYNOLDS METALS

REYNOLDS ALUMINUM

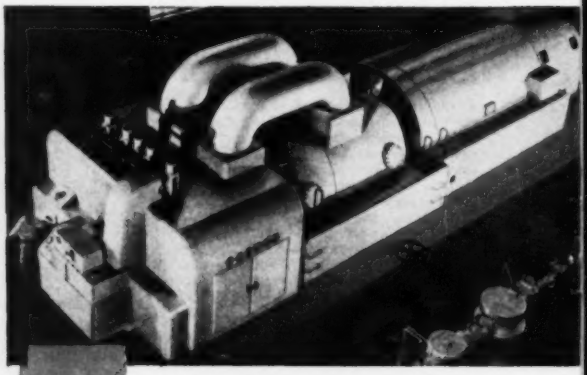
POWER for the



ALABAMA area has experienced an industrial power consumption rise of over 12½% in one year's time. To help meet this rocketing power demand, the Alabama Power Company just recently installed this Allis-Chalmers 40,000 kw steam turbine hydrogen cooled generating unit at its Chickasaw station in Mobile. A-C also supplied the 30,000 sq ft surface condenser and its auxiliaries, including two 25,000 gpm circulating pumps and motors.



ARKANSAS has the largest U. S. deposit of bauxite ore, primary to the production of aluminum. These two Allis-Chalmers 40,000 kw condensing, tandem compound steam turbine hydrogen cooled generating units form the Lake Catherine steam-electric station of the Arkansas Power & Light Company. Most of this power is used to electrolytically reduce alumina.



LOUISIANA industry and agriculture are mushrooming. The Gulf States Utilities Company — serving an area from Baton Rouge to across the Brazos River in Texas—has doubled its customers and tripled its power generation in the last decade. A-C recently supplied 75,000 kw in generating capacity to Riverside station near port city of Lake Charles. Unit shown is 40,000 kw.

Booming South!

NEW ALLIS-CHALMERS TURBINE-GENERATORS HELP SUPPLY MUSHROOMING INDUSTRIAL DEMAND

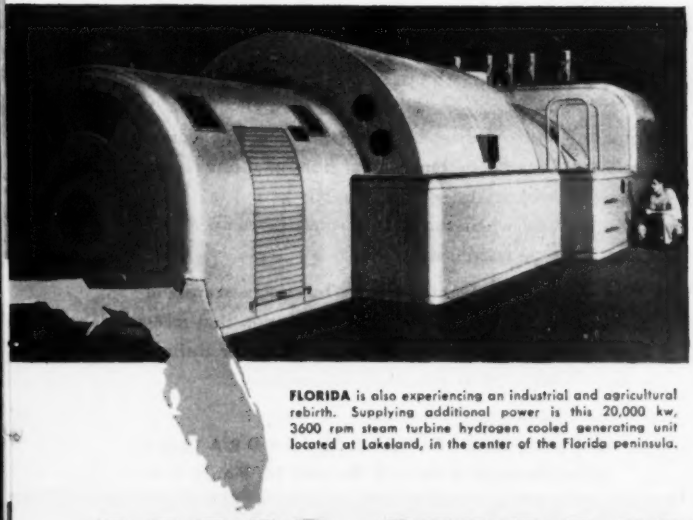
YOU'VE HEARD OF the South's mushrooming industrial growth. Here are some of the Allis-Chalmers steam turbine generator units newly installed to help satisfy that insistent power demand.

All these modern units conform to AIEE-ASME preferred standards in addition to incorporating many exclusive Allis-Chalmers main design features. The hydrogen cooled generators all have the A-C originated "walk-in" exciter housings. And these 3600 rpm turbines all have the following outstanding features:

Hydraulic control and operation with accessible placement of main stop valve; centralized grouping of operating controls; cam-operated inlet valves accessibly located on top of cylinder; and exclusive A-C method of temperature compensation for horizontal *and* vertical thermal movement.

All oil piping is above the floor, simplifying foundation and installation. And, as throughout the complete Allis-Chalmers line—ranging from the smallest single cylinder machines to single shaft, tandem compound, condensing units of 150,000 kw—labyrinth steam seals are used. The steam sealed gland system is self-contained and provides dependability with minimum attention.

You get the real design advances *first* from Allis-Chalmers. When planning the installation or expansion of your steam-electric power plant, let A-C simplify your problem. This *one* source will provide you with the world's widest range of power plant equipment. For your copies of literature on all products mentioned, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3842



FLORIDA is also experiencing an industrial and agricultural rebirth. Supplying additional power is this 20,000 kw, 3600 rpm steam turbine hydrogen cooled generating unit located at Lakeland, in the center of the Florida peninsula.

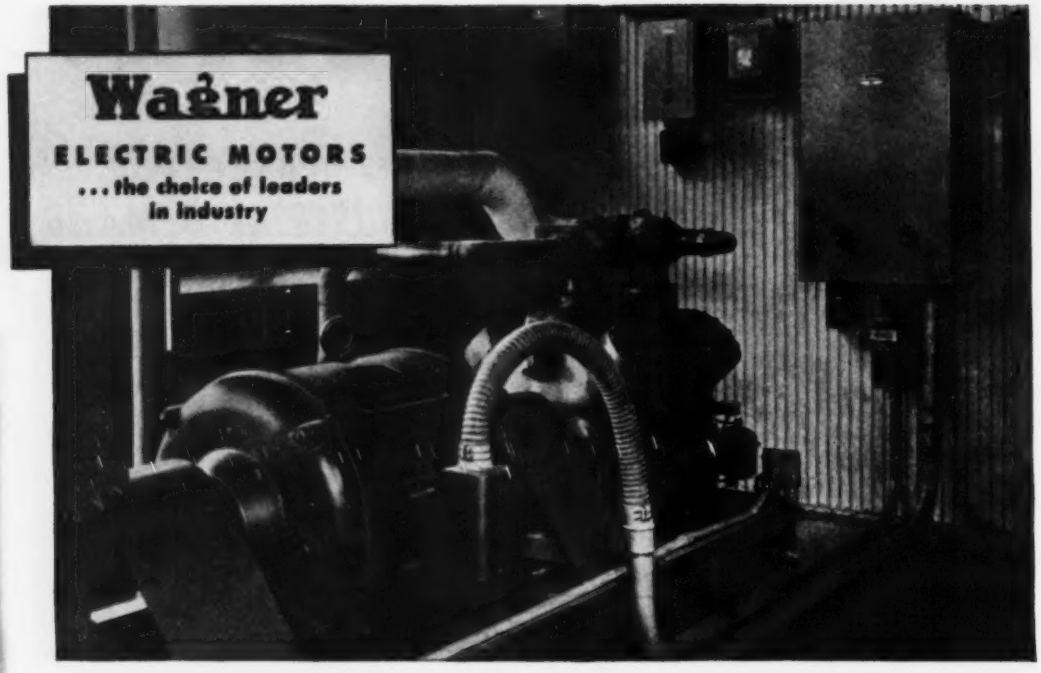
ALLIS-CHALMERS *firsts*

Simplified hydrogen seal and control
World's lowest exhaust pressure steam turbines
Solidly-bolted-down steam end pedestal
Turbine for one-boiler-per-turbine arrangement
"Walk-in" exciter housing
30,000 kw, 825 F turbine, in 1931
825 F reheat turbine, in 1935
AND NOW...First with supercharged hydrogen cooling!

ALLIS-CHALMERS

World's Widest Range of Power Plant Equipment

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING



Power Companies Benefit... Their Customers Benefit...

when the Wagner Increment Motor and Starter Combination is put on the line

The Wagner part-winding increment motor and starter combination provides an economical method of starting polyphase squirrel-cage motors for any application where reduced current draw at start is required or desirable. No auto-transformers or resistors are necessary.

Power Companies and their customers *both* benefit when the Wagner increment motor and starter "package" is installed.

Voltage disturbances on the line are reduced because current taken from the line is not broken during the starting period—as is the case when auto-transformers or compensator-type starters are used.

Customers are enabled to buy the most economical motor and starter combination that meets locked current limitations. Write for Bulletin MU-128. It gives full information.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Avenue • St. Louis 14, Mo., U. S. A.

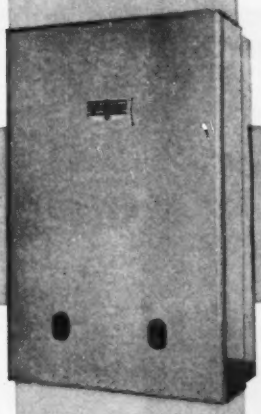
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

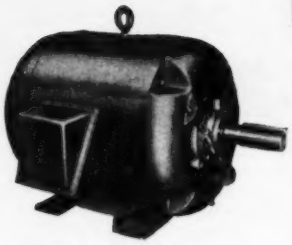
MS2-11 Rev.

Open General Purpose Motor
Normal or High Torque

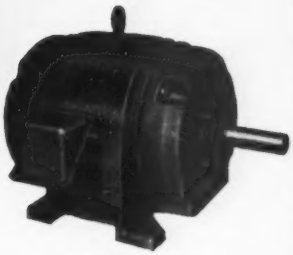
Explosion-Proof Motor
Normal or High Torque



This magnetic part-winding increment starter can be furnished in combination with any of these Wagner Motors.



Totally-Enclosed Fan-Cooled
Motor—Normal or High Torque



Splash-Proof Motor
Normal or HigH Torque

Here's how it works:

Wagner polyphase motors for part-winding increment starting, both normal and high torque, are wound with two circuits in parallel. The magnetic type increment starter has two magnetic contactors. When the first contactor closes, the line is connected to one group of the motor windings and a pneumatic timer is started. After the desired time interval, the pneumatic timer closes the second magnetic contactor which connects the line to the other part of the motor winding. Using this motor and starter combination, the current drawn from the line is about 60 percent of the normal locked current of the motor.

Facts from
NEBRASKA

"'CSP®' Transformers cut installation costs up to $38 per unit"

"Our urban and close suburban distribution areas (outside the downtown network system) became seriously overloaded, and had to be converted to a higher voltage. Since much of it served desirable residential areas, we were anxious to obtain clean-looking pole tops. Therefore, we decided to use 'CSP' Transformers exclusively," says a Nebraska Utility.

"We realized savings in installation costs averaging $34.37 per unit. Since 630 transformers were involved, a total saving of approximately $22,340 was realized. In addition, we benefit by the greater protection against overloads and short circuits which is inherent with the 'CSP' Transformer and with the continuous load check provided by the signal light.

"We found the following comparison of costs:

Conventional Transformer		*'CSP' Transformer*	
Arrester installed	$29.00	Additional cost of "CSP" over the conventional transformer—includes built-in lightning and thermal protection plus load indicating light	$30.38
Cutout installed	25.00	Higher pole for secondary clearance (required in some instances)	2.00
Two 7-foot crossarms installed	14.00		
One 5-foot arm installed	2.50		
Total	$70.50	**Total**	$32.38"

Installation and maintenance costs for "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

	"CSP"	*Conventional*
Installation Cost	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS

J-70597

How to be Sure You Don't get "SHORT-CHANGED"

...NEXT TIME YOU BUY TAPE!

While minimum length can be depended on to be accurate in any roll of tape, it's the *weight* of the roll that you must watch. It is important for you to know: Does the No. 4 Roll actually weigh 4 ounces, as it should; and the No. 8 Roll 8 ounces?

For weight reveals whether tape is full strength in substance, or whether its protective and adhesive properties have been weakened due to skimpy materials. Underweight tape means you must use more of it, and take the extra time to roll more on, when a job requires maximum tape protection.

You can always weigh every roll you buy, of course, but why bother, when HAARTZ-MASON publicly makes you a DUAL GUARANTEE — a guarantee covering both weight and length, and prints this information boldly on every roll and container.

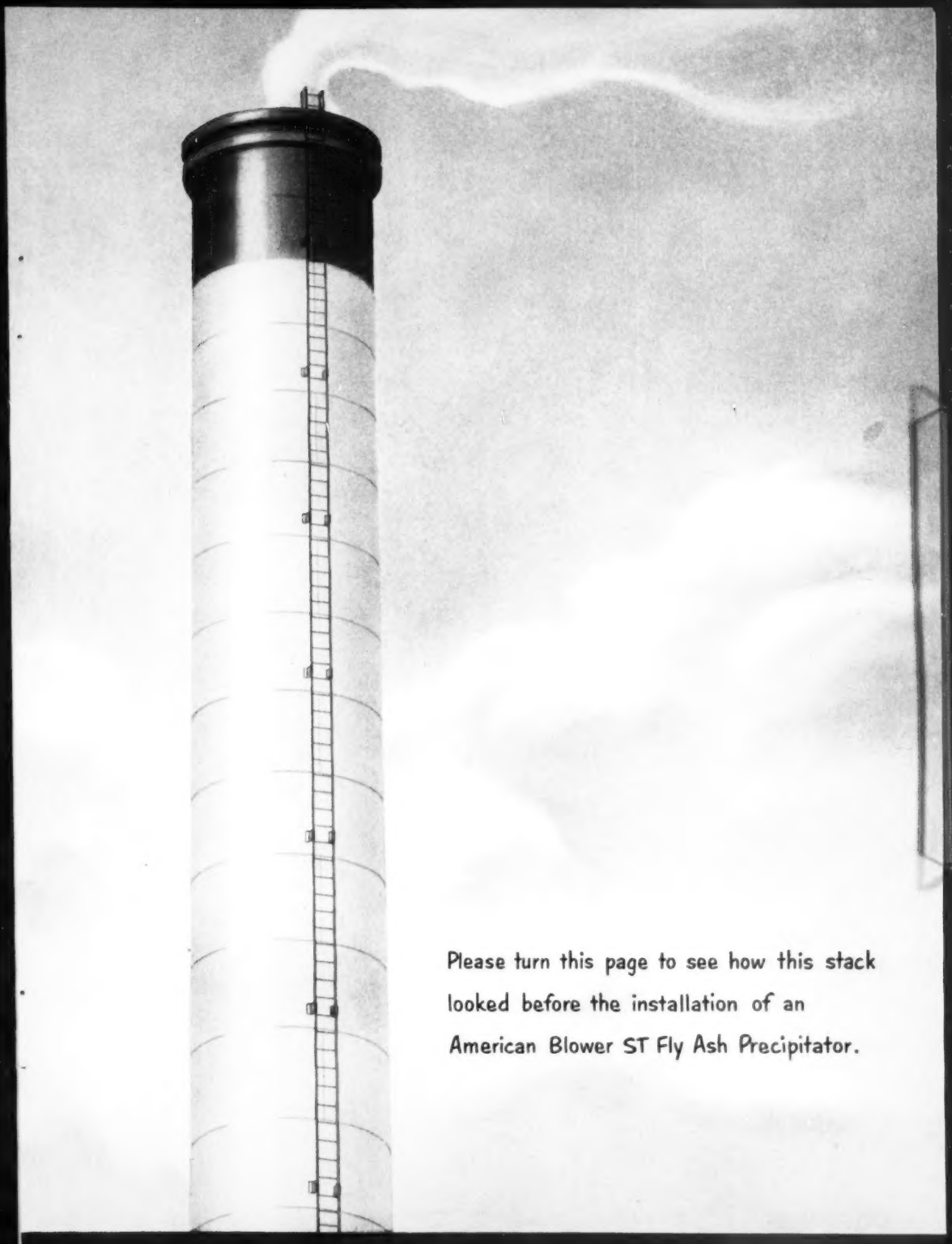
So get full measure the next time you buy tape by accepting none but the DUAL GUARANTEED HAARTZ-MASON brands.

Haartz-Mason, Inc.
WATERTOWN 72, MASSACHUSETTS

PARAPLASTIC Plastic Tape that does the work of both rubber and friction.

Note: Weight and length information are printed boldly on every roll and container.

By Invitation Member
Emblem of
BUSINESS CHARACTER
Rice Leaders
of the World
Association



Please turn this page to see how this stack looked before the installation of an American Blower ST Fly Ash Precipitator.

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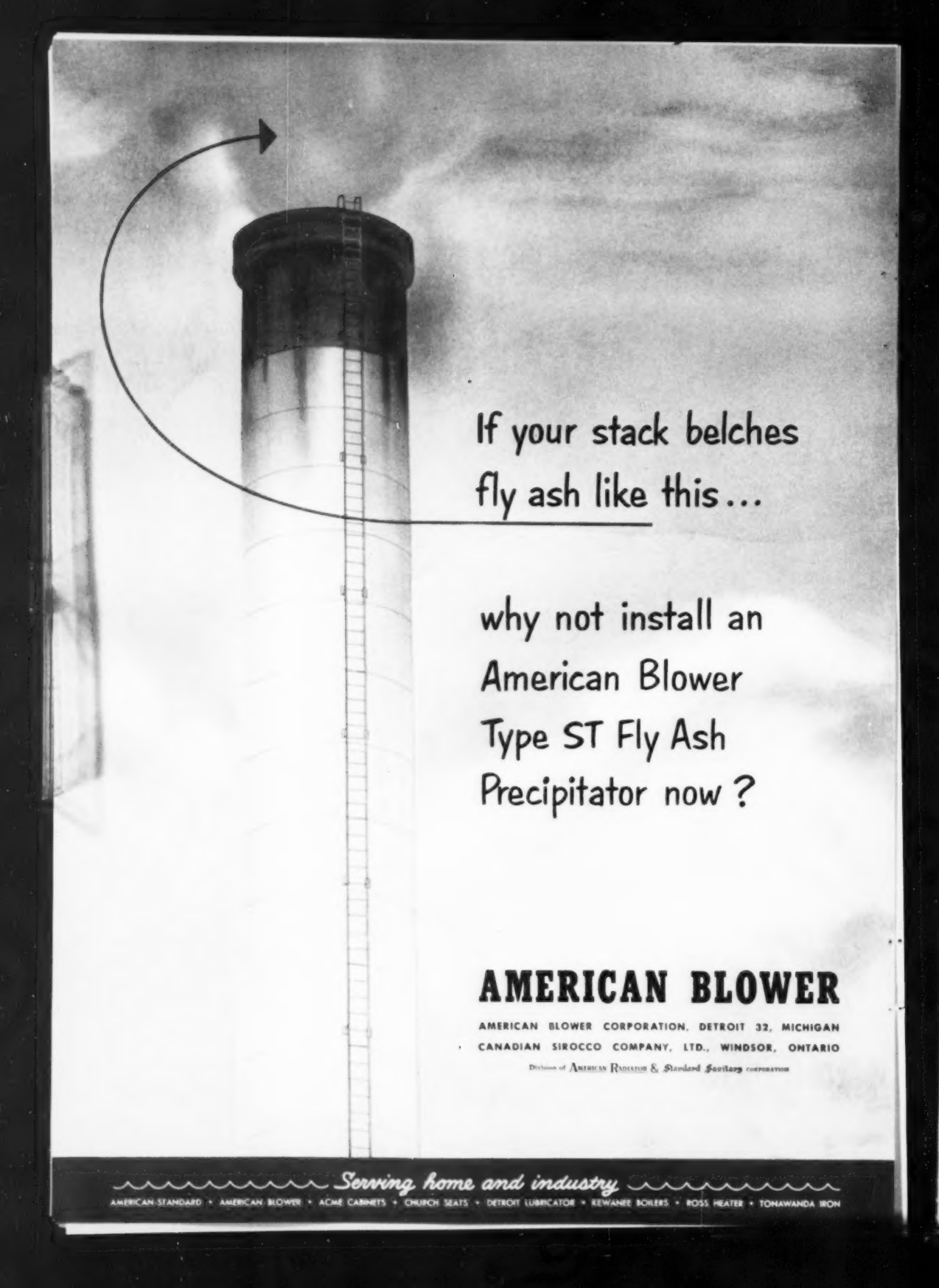
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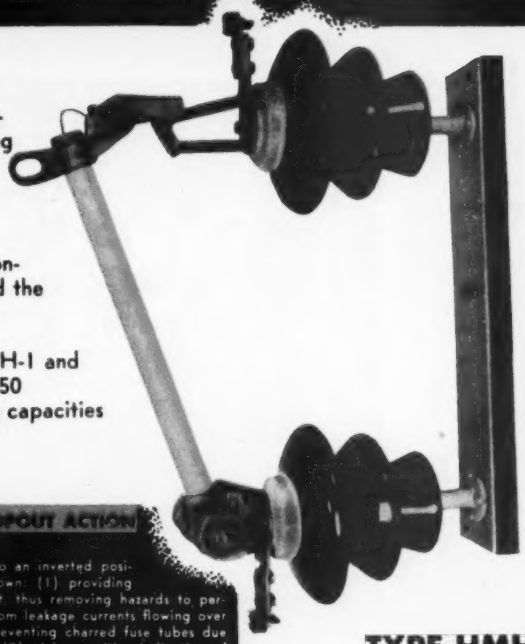
Here's the Power Fuse . . . .

FOR EXTRA HEAVY DUTY

Meet the granddaddy of expulsion power fuses. You'll find him in substations and switchyards, protecting power and potential transformers, distribution feeder lines and transmission lines.

He steps in where short circuit or continuous current requirements exceed the capacity of other expulsion fuses.

He's the Southern States Type HMH-1 and is available 7.5 kv through 161 kv, 50 through 400 amps with interrupting capacities to 30,000 RMS amps.

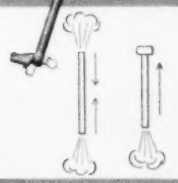


TYPE HMH-1

46 kv
50-100-200 amp

FULL DROPOUT ACTION

The fuse holder swings to an inverted position when the link is blown: (1) providing an air gap in the circuit, thus removing hazards to personnel and equipment from leakage currents flowing over the tube surface; (2) preventing charred fuse tubes due to leakage currents and (3) giving positive indication of fuse operation.



DOUBLE VENTING

Fuse tubes are vented at both ends allowing gases generated by the arc of the rupturing link to be expelled in opposite directions. This results in increased interrupting capacity in a given size tube. Since the two escaping columns oppose and balance each other, recoil from the high velocity of expelled gases as experienced with single vented tubes is eliminated.

INTERCHANGEABILITY

Interchangeable fuse holders make the Type HMH-1 easily adaptable to changing requirements. Fuse mountings rated 50, 100 and 200 amps are identical and will accommodate fuse holders rated either 50, 100 or 200 amps. Similarly fuse mountings rated 300 and 400 amps will accommodate fuse holders rated either 300 or 400 amps. The tables indicate the degree of interchangeability possible in the 15 kv rating only, however the same pattern is followed in all voltage ratings.

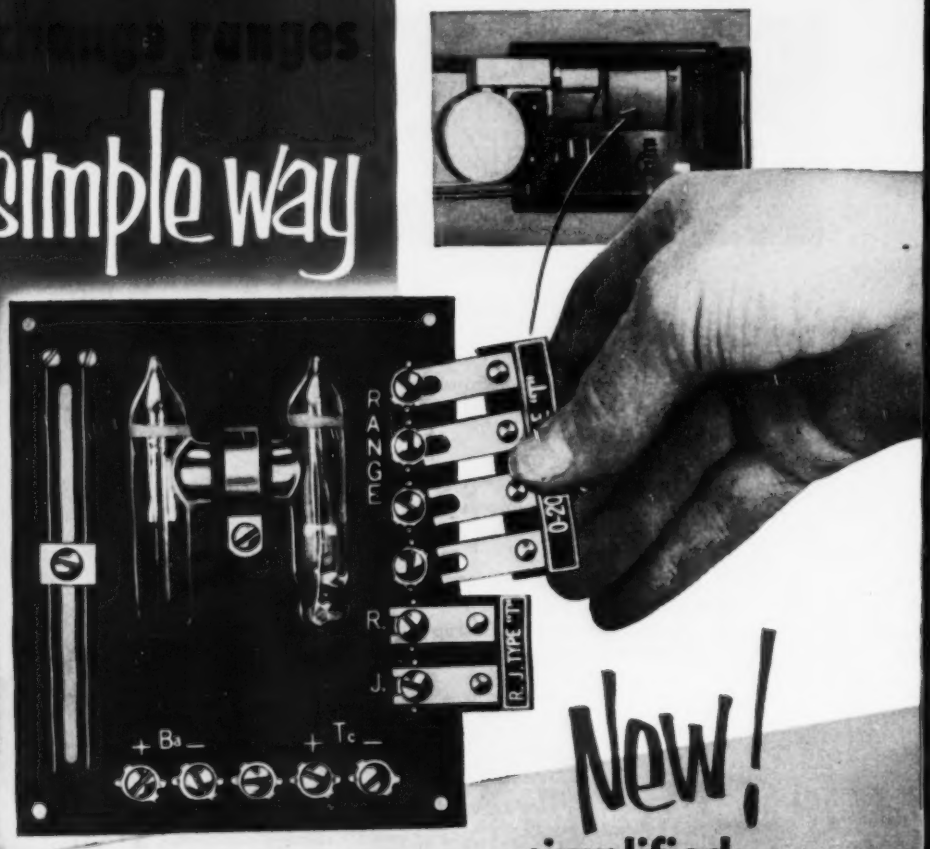
kv	Int. Cap. RMS amp	Continuous Current Rating
15	8,000	50
	12,000	100
	16,000	200
15	20,000	300
	26,000	400

For complete information write for Bulletin No. 52HMH1

Southern States Equipment Corp.

HAMPTON GEORGIA

You change ranges this simple way



New!

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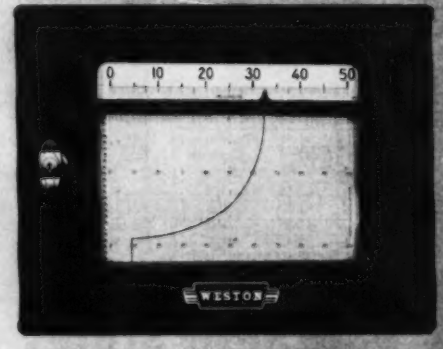
Recording Potentiometer by WESTON

The question probably occurs to you, as it has to many other instrument users who have examined the new WESTON Recording Potentiometer, "Why haven't such improvements been offered before?"

Take range changing, just as an example. *You* make the change, simply by inserting the desired range standard, as illustrated above. Not even a soldered connection to break. No change in the universal slide-wire necessary. And reference junction compensation is changed in like manner, when changing type of sensing element.

And there are many more features, electrical and mechanical, that remove the complexities from instrument operations and maintenance. They're all found in this new WESTON Recorder. Ask us to send you all the facts . . . WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey . . . *manufacturers of Weston and Tag Instruments.*

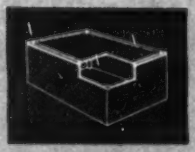


WESTON TAG **WESTON** *Instruments* . . . INDICATE — RECORD — CONTROL

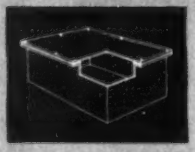
STANDARD | CUSTOM

...CAST BOXES* BY HOPE

STANDARD TYPES & SIZES



UNFLANGED BOXES
H1200 Type
164 sizes
from 4 x 2 x 2 to 48 x 36 x 17



FLAT FLANGED BOXES
H8000 Type
87 sizes
from 4 x 4 x 3 to 36 x 36 x 12

HINGED COVER BOXES
H3200 Type
128 sizes
from 5 x 5 x 3 to 36 x 36 x 12

FLANGED RECESSED COVER BOXES
H7000 Type
51 sizes
from 4 x 4 x 3 to 30 x 24 x 12

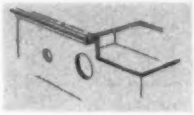
CHECKERED COVER SIDEWALK BOXES
H5800 Type
53 sizes
from 6 x 6 x 4 to 36 x 24 x 14

STANDARD BOXES are of strong, dense cast iron—hot dip galvanized for long service and attractive appearance. Weatherproof construction—rubber-gasketed closure prevents entry of rain, snow, sleet or dust under normal conditions.

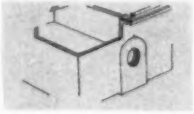
CUSTOM VARIATIONS

You can specify any of these modifications in standard BOXES by HOPE —have them factory-made at moderate cost—and get prompt delivery.

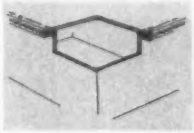
DRILLING—
or drilling and tapping—
of conduit entrances



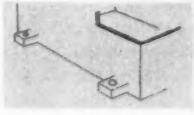
BOSSES—
to provide extra thickness
for five-thread conduit entrances.
Drilled and tapped to specification
if desired



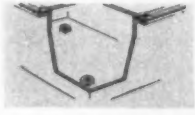
SPECIAL GASKETS —
Neoprene for fungus resistance in hot, humid climates • pure gum for extreme softness and resistance to special acids • Vellumoid for resistance to oils and fats • graphite-free compressed asbestos for installation near boilers or steam pipes



MOUNTING LUGS—
drilled for any desired
bolt size



INTERIOR MOUNTING BUTTONS—
—tapped blind
to specified centers



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"TRIANGLE TESTING"

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ROLLER-SMITH "ON THE LINE" TEST STATION

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When you purchase Roller-Smith and Elpeco equipment you are assured of perfect performance and extreme durability. Before any design is finally approved, both development models and production units are tested in accordance with applicable standards. Interrupting capacity and high current testing is done "in the field" under conditions of system stability exceeding those encountered under normal service conditions. The Roller-Smith Test Station, located directly adjacent to the Siegfried Substation, receives power at 66 KV from the 220 KV transmission system forming the Siegfried-Roseland-Plymouth Meeting "Triangle." Testing in this manner, rather than simulating the power conditions, insures your getting "more for your money" when you specify and buy—Roller-Smith and Elpeco.

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ROLLER SMITH

ROLLER-SMITH CORPORATION AND ELPECO DIVISION

BETHLEHEM, PENNSYLVANIA

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somewhere in your building,
lurking like a cat....
fire is ready to pounce.
In flammable liquids,
electrical equipment, record
vaults. Your surest protection
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CO_2 Fire Extinguishing System.

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Easier to Install

P-L ANCHORS

Blades are properly shaped to glide smoothly and easily into solid, undisturbed earth with just a few blows of the tamping bar . . . Heavy-gauge, high-strength steel used throughout. Deeply embossed and ribbed blades withstand heavy loads without buckling . . . Correctly aligned with grain of steel to prevent tearing and breaking—an absolute necessity for anchor strength.

Above type available in 8" diameter with 100, 115 and 135 square inch expanded area. Other types and sizes also available.

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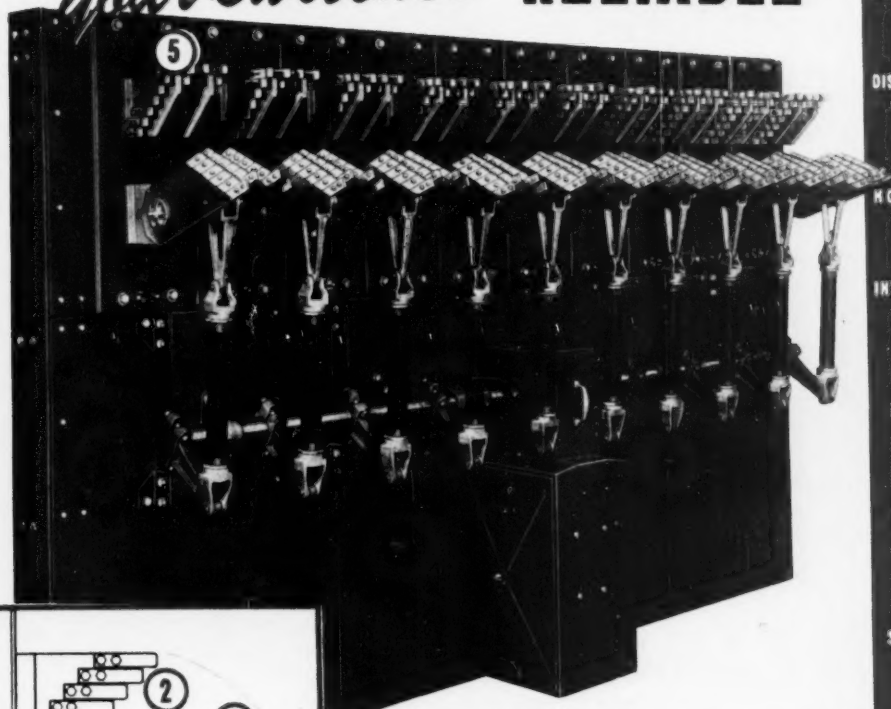
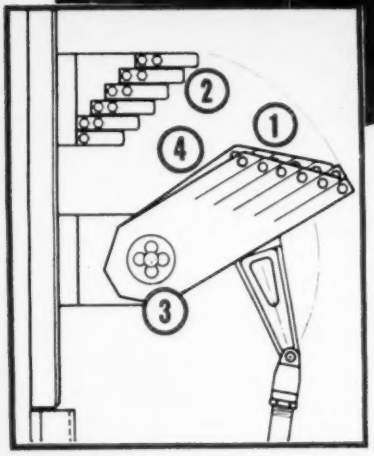
ORIGINATORS OF THE BENDING RINGS ANCHOR

Because you demand your switches RELIABLE





Drawing above shows a single pole 6,000 Amp. Switch for group operation.

Illustration above shows a special application of ten single pole switches with a total rating of 60,000 Amp. The switch is used to interrupt current and is installed in parallel with a 6,000 Amp. Breaker which remains closed until switch is fully open. When fully open, an auxiliary switch in the operating mechanism trips the breaker. Any slight arcing during transfer of current occurs at the special arcing fingers (5)

This type of installation is ideal for potline switching and reduces the cost of high capacity interrupting equipment.

Check the facts on the [redacted]

60,000 Amp. Motor Operated HIGH PRESSURE CONTACT SWITCH

1. **HI-PRESSURE SPOT SILVER-TO-COPPER CONTACTS** - self-cleaning with each blade operation.
2. **CONTACT JAW** - Copper tongue and beryllium copper contact fingers - providing high conductivity, together with proper application of strength and resiliency.
3. **HI-PRESSURE HINGE CONTACTS** - uniform pressure in all blade positions through annular, live contact blade surface. Uniform pressure maintained by use of special spring washer with less critical adjustment than ordinary cup spring washer.
4. **EASY BLADE OPERATION** - through sequence blade movement - contact pressure released from inside pair of blades before the outside pair start movement.

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

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If you're looking for a longer-lived, more weather-resistant, more dependable service entrance cable – take a good long look at what Silvaline* Type SE with true URC Weatherproof protection offers you.

1. **GENUINE URC SATURANT** – not an inferior substitute – makes Silvaline's durable fibrous covering indefinitely resistant to weather.

2. **TOUGH NEOPRENE TAPE** covers each individual conductor – increases resistance to moisture and weather . . . in 2 colors, black and red – gives the preferred means of conductor identification.

3. **OVER-ALL MOISTURE-SEAL TAPE AND BRAID COVERING** provides high resistance to deterioration and adds life to the covering.

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WIRE AND CABLE

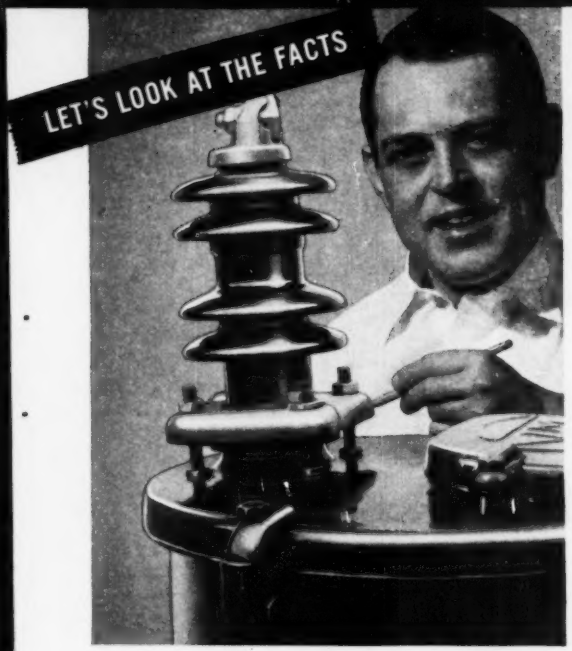

FIGURE 1. Cover bushings on an L-M Round-Wound 15 kva 7200 volt transformer. Note the generous width of skirting for high creepage distance, the four-bolt cover clamp that assures even pressure on gasket and porcelain.

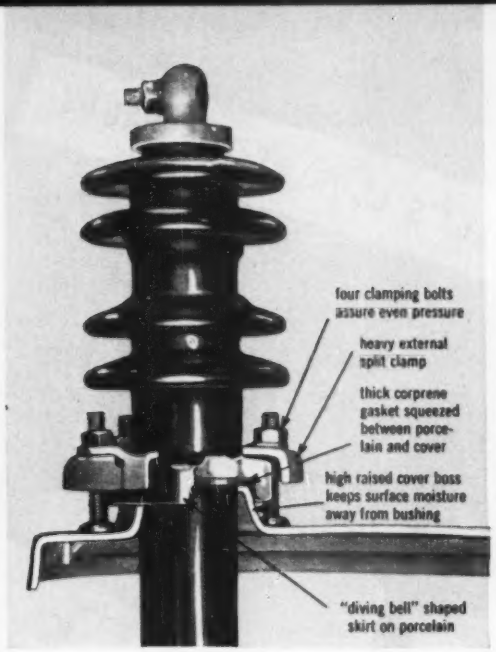
four clamping bolts assure even pressure
heavy external split clamp
thick corprene gasket squeezed between porcelain and cover
high raised cover boss keeps surface moisture away from bushing
"diving bell" shaped skirt on porcelain

FIGURE 2. Close-up of triple-seal against moisture. 1. Deep-skirted porcelain gives "diving bell" effect. 2. Thick corprene gasket, squeezed between porcelain and steel boss. 3. Deep-drawn cover boss keeps moisture away.

Cover Bushings on L-M Round-Wound Transformers Triple-Protected Against Moisture, Corona

"Diving Bell" design porcelain, thick corprene gasket, and high raised boss on cover provide triple barrier

By **ALVIN B. COYLE,**
Manager Transformer Sales
Line Material Company

In the design of cover bushings, L-M engineers have gone to great lengths to eliminate moisture entrance and corona, which would cause undesirable radio interference.

The porcelain itself is designed with exceptionally generous creepage distance and high wet-flashover characteristics. The best grades of electrical porcelain are used, with the surface fully glazed. At the bottom is an extra skirt or lip, which is curved downward to give a "diving bell" effect in keeping moisture away from the gasket.

The porcelain is mounted on an exceptionally high raised boss in the cover, which in itself leads moisture away from the bushing. Between the boss and the porcelain is a thick corprene gasket tightly squeezed by the four-bolt cover clamp. Corprene has the initial hermetic sealing property of synthetic rubber plus the elasticity and non-flowing characteristics of cork to maintain a permanent vapor-proof seal.

The result is a bushing that provides exceptional protection against moisture and breathing; it is corona-free and causes no radio interference.

Get Full Information

These cover bushings are standard equipment on all L-M Round-Wound transformers of 5000 volts and over. For more information on these and other features of these outstanding distribution transformers, ask the L-M Field Engineer; or write Mr. Coyle at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round Wound" is a Line Material Company trademark.

LINE MATERIAL 87R
Transformers
Complete Coordinated Equipment for Distribution Today
LM ORTO

FIGURE 1—Earl J. Kirsch, Assistant Manager, Transformer sales, exhibits the L-M Round-Wound core-coil assembly, which provides an almost ideal magnetic circuit. The wound core has no air gaps; has stable characteristics, low exciting current. Long round coils wound directly onto the core encircle a large part of the core, making possible fewer winding turns and lower copper loss.

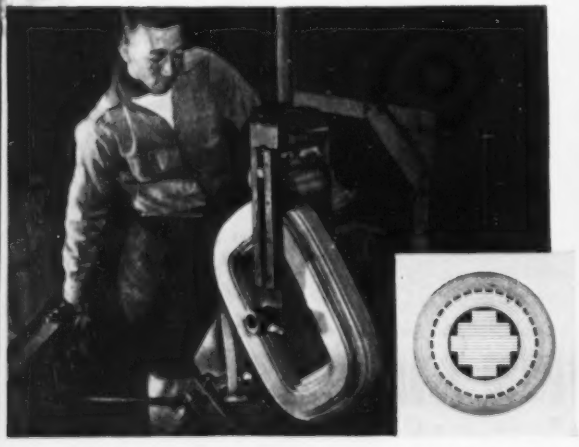

FIGURE 2—Core is tightly wound, under tension, of continuous strip of oriented silicon steel, of varying widths to provide a core of nearly round cruciform cross section.

FIGURE 3—The cross section of the wound core is cruciform, closely approximating a round form.

FIGURE 4—After the core is annealed, coils are wound directly on the uncut core, by means of split winding flanges driven by gears on the L-M exclusive winding machine.

How L-M Round-Wound Design Cuts Losses in Distribution Transformers

by **James G. Everhart**, Chief Engineer, Transformer Division, Line Material Company

Utility companies are under terrific pressure today between higher costs and higher taxes on the one hand, and lagging revenues on the other hand. Today, as never before, power must be distributed with the utmost economy, and great attention is being devoted to the reduction of every possible loss.

Transformer losses are one factor that is receiving extensive study, by both the operating companies and the manufacturers.

In this economy drive, transformer loading is also receiving major attention, with a view to maximum utilization of equipment—and this introduces another factor into the study of losses.

The Battle for Savings

The ratio of losses of a distribution transformer affects overload capacity. The copper loss watts vary as the square of the overload. In comparing two transformers of identical physical proportions including coil cooling surface exposed to oil, it is obvious that the unit with higher copper loss has less overload capacity before damaging temperatures are reached than does the transformer with lower copper loss. This effect is further emphasized by the fact the high copper loss dictates a small unit with less surface.

Core loss, on the other hand, is something the utility company pays for 24 hours a day. Therefore the designer must take both core and copper losses into account in providing the best possible balance of performance characteristics.

Exciting current, another factor in operating cost, is deserving of attention, and should be reduced to whatever extent can be done by a design that does not at the same time sacrifice other performance characteristics.

"Balanced Performance"

To meet these considerations, transformer design must essentially be a series of compromises. The L-M Round-Wound transformer consists of a wound core, with long round coils wound directly onto the core (Figure 1). This construction offers certain inherent advantages which make it possible for L-M designers to minimize compromises and offer *balanced performance*.

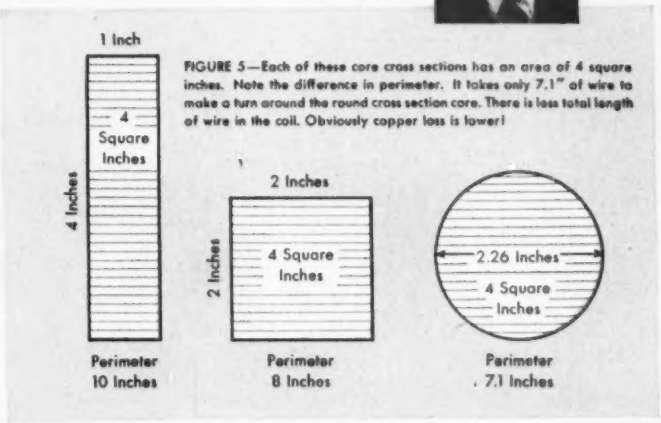

FIGURE 5—Each of these core cross sections has an area of 4 square inches. Note the difference in perimeter. It takes only 7.1" of wire to make a turn around the round cross section core. There is less total length of wire in the coil. Obviously copper loss is lower!

Wound Core Is Not Cut

First of these inherent advantages is the exclusive L-M wound core itself. It is tightly wound of continuous strip of cold rolled oriented silicon steel, with no cuts, laps, or gaps (Figure 2). This superior core makes possible the higher overload capacity and balanced losses of the Round-Wound transformer.

Lower Exciting Current

Since the core is not cut, no air gaps are created which would break up the flux path and produce higher exciting current, with consequent loss in revenue.

Low Core Loss

The higher magnetic efficiency of this core makes it possible to achieve low core loss easily, while the core at the same time contributes greatly to balanced performance. Incidentally, this continuous core is also far more quiet than one which contains air gaps.

Another advantage of the L-M wound core lies in the fact that the cross section is cruciform, approaching the round (Figure 3). Round coils are wound directly onto the core in an L-M designed winding machine (Figure 4). As shown in Figure 5, these coils allow a reduction in the perimeter of the coil and permit more efficient utilization of the copper. With the same cross section wire, and the same number of turns, there is less total length of wire, and less watts of copper loss. This is one of the inherent advantages of the L-M wound core that gives the designer more leeway in achieving a proper balance of performance characteristics.

Detailed typical performance characteristics of Round-Wound transformers are available from the L-M Field Engineer, or by writing Mr. Everhart at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round-Wound" is a Line Material Co. trademark.

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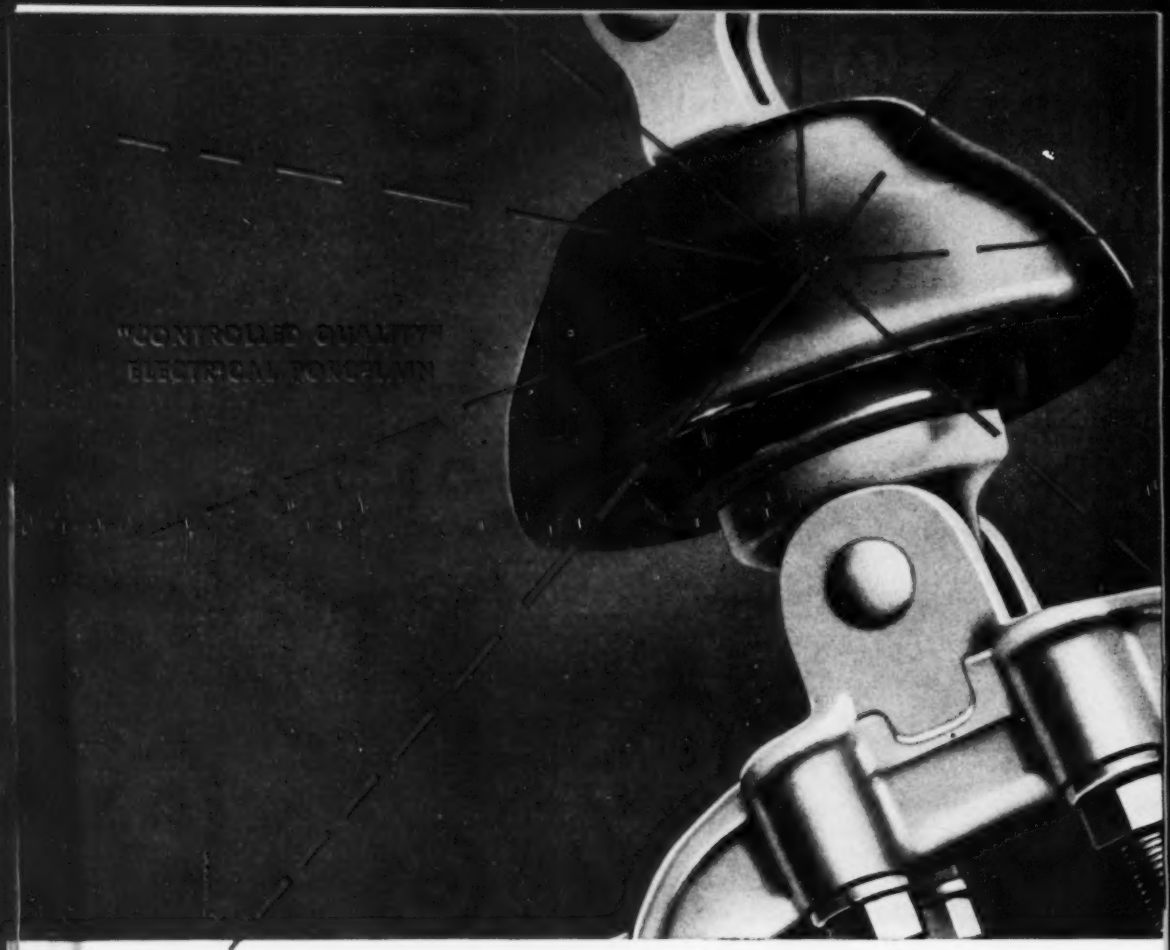
LINE MATERIAL Transformers

Complete Coordinated Equipment for Distribution Today



Shoots J-D "Bronco" Insulator 49 Times—No Failure!

by **W. V. SWAN**, Manager, Porcelain Sales, Line Material Company

L-M's J-D "Bronco" is a big, rugged insulator with a heavier and stronger porcelain body than the conventional suspension insulator. Therefore it is more resistant to breakage caused by rough handling or amateur sharpshooters.

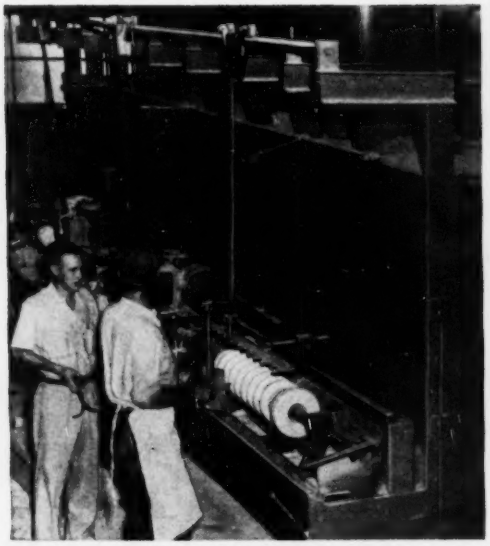
The gun-fire test was made to determine whether a standard "Bronco" insulator would flash over or pull apart while under gun fire. A regular production sample was suspended from an insulated post, under load. A hot 20,000-volt line was connected to the top terminal, and the bottom terminal was grounded.

From a distance of 15 feet, 22-calibre long rifle shells were fired directly at the insulator. After 49 shots, the insulator had not flashed over or pulled apart; and there was no appreciable damage, as shown in the photograph at the right. The insulator was then tested. It still had its original mechanical strength of 10,000 pounds. Dry flashover had dropped only from 60,000 to 45,000 volts, still high enough to carry its normal line voltage.

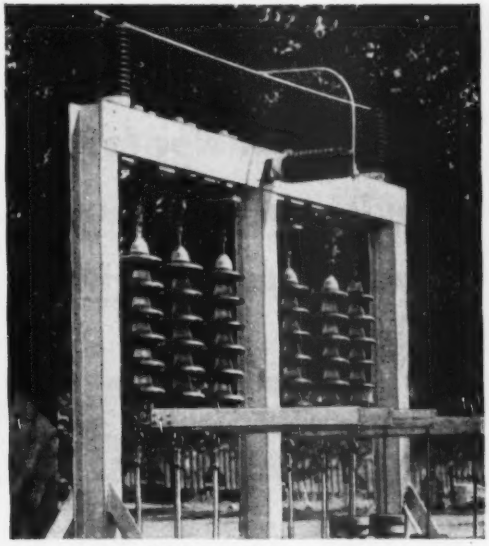
Seldom does any insulator have to take this sort of test. Yet the fact that the "Bronco" could take it shows its exceptional ruggedness. That is why one major utility company standardizes on the J-D "Bronco."

"Controlled Quality" Produces Better Insulators

At the J-D plant, quality is closely controlled through inspection of raw materials, constant check on production processes, and thorough inspection and testing of finished goods.



Quality is carefully controlled and checked, all through the production process. Before firing, molded and dried porcelain is carefully machined or trimmed to the required size and shape. At the same time it is inspected, and any imperfect specimens are eliminated.



One of several mechanical and electrical tests of J-D strain insulators. All strain insulators are given the "M&E" test as a regular part of the production schedule, and a certain number of each batch are put through a rigid complete destruction test.

J-D has made many contributions to quality control in electrical porcelain. The tunnel kiln is a J-D development. This kiln consists of a tunnel about 200 feet long, in which firing temperatures can be closely controlled. Cars of porcelain move slowly through this kiln, at controlled speeds, with closely controlled temperatures. Firing is so even that internal stresses are almost completely eliminated. This is one reason for the ruggedness shown by J-D insulators.

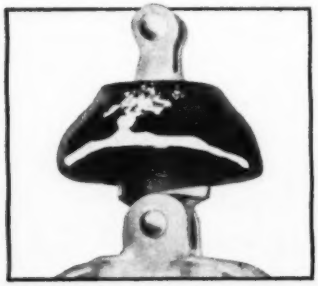
Another J-D contribution is the fuchsine dye test. This is a method for determining the porosity of the porcelain—which in turn determines the strength and insulating value of electrical porcelain. In this test, unglazed porcelain fragments are dipped into the dye under controlled time and pressure. Then a section is broken from the specimen. Any penetration of the dye indicates a porous structure, which is weak. If the dye does not penetrate, the structure is dense, and strong.

First Porcelain-Housed Cutout

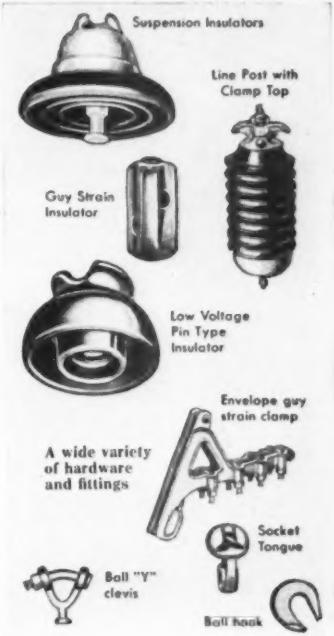
J-D was the first to make a wet-process fuse cutout box, originated in 1926 by Line Material. Prior to that time, cutouts had been housed in wooden "birdhouses." L-M conceived the idea of a porcelain housing, which would provide greater protection and better insulation, and went to J-D with the problem. Today the porcelain housing is, of course, standard in the industry.

Complete Line of Porcelain and Hardware

L-M offers a complete line of J-D insulators, fittings, and hardware. These products amply meet all EEI and NEMA standard specifications. *Every insulator* is given a tensile strength test and flashover test, in addition to other regular inspections. For complete information about L-M's line of J-D products, ask the L-M Field Engineer, or write Mr. Swan at Line Material Company, Jeffery-DeWitt plant, Kenova, W. Virginia (a McGraw Electric Company Division). 93R



SHOT 49 TIMES—and this is all the damage caused by 22-cal. long rifle cartridges! The insulator still has its original mechanical strength, and dry flashover dropped only from 60,000 to 45,000 volts, still ample to carry the load.



LINE MATERIAL

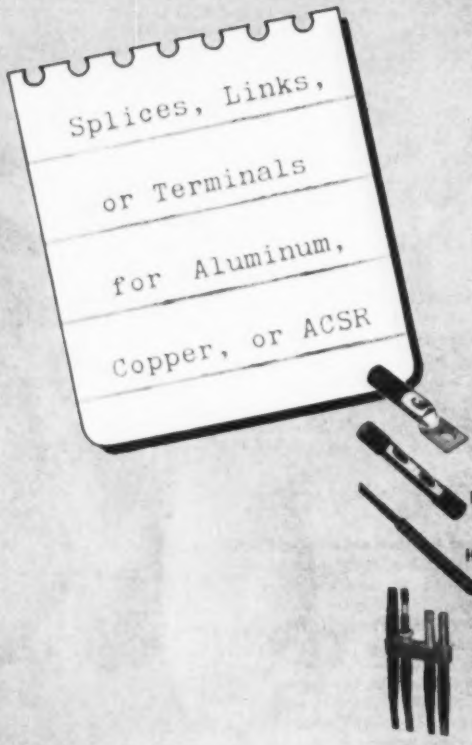
Electrical Porcelain Insulators

hydraulic power for quick, economical connections anywhere

FOOT OPERATED HYPRESS*

BURNDY

lightest tools



HYDENT CONNECTORS...

Listed by Underwriters' Laboratories in all sizes — #22 through 2,000 Mcm.

Recommended for hydraulic tooling from #9 through 2,000 Mcm.

HYLUGS and HYLINKS One piece, pure copper, tubular construction. Indent on any side of barrel. Can't split. No intermediate contact surfaces, current carried by entire cross-section. Plated to resist corrosion. Ask for Catalog Y53B.

HYSPLICE Full tension and loop. Multiple indents compress conductor with firm, uniform grip... develop holding power greater than rated minimum breaking strength of conductor. Ask for Catalog HS51B.

HYCRAB Insulated multiple connector. Most economical method of joining cables in underground networks. Ask for Catalog Z47B.

*Air or electrical driven units can replace foot pump where required

electrical connectors and installation tools by...

HYPRESS

per ton of delivered force

HYDENT INSTALLATION . . .

A time saving, money saving method of making permanent, uniform connections faster. Made feasible for general use when Burndy developed portable hydraulic installation tooling 15 years ago. Better connections assured by intimate, high pressure contact between connector and conductor. Quickly interchangeable dies permit each tool to be used over wide range of conductor sizes.

MANUAL HYPRESS

OVERHEAD and UNDERGROUND "A 9-lb. tool with a 9-ton bite" makes the manual Hypress the lineman's favorite. Rotating head through 90°. Neoprene insulated for hot line operation at secondary distribution voltages —helps protect against shorts at higher voltages.

For maneuverability in cramped quarters—for indenting pressures to 80,000 lbs. and for wire or cable through 2,000 Mcm—the foot operated Hypress is predominant. Swivel jointed flexible high pressure hose permits use at any angle.

CONSTRUCTION WIRING

Cost comparison was made recently on a construction job involving 160 connections for wire of average size. The savings on Hydent connectors (against cast connectors) more than paid for the Hypress. On future jobs this contractor will save over 80% of his former connector cost. Even against the most economical type of bolted connector, savings would average 40%-50%.

52-19

BURNDY ENGINEERING COMPANY

NORWALK, CONNECTICUT • BURNDY CANADA, LTD., Toronto 8, Ontario

SORGEL
AIR-COOLED
Dry-Type
TRANSFORMERS

for Every Purpose

To operate 115 volt lighting and portable equipment from 230, 460 or 575 volt power circuits, and higher distribution voltages.
To operate special equipment from standard circuits.
To change odd voltages to standard voltages and phase changing.

Also Sub-Stations and Power Centers

for indoor installations

Engineered to meet your exact requirements. Not necessary to design or change your installation to fit a "standard."
Any type of primary switch gear.
Metering—primary or secondary, to suit.
Secondary breakers, main, branch, or tie.
All incorporated with high quality, liberally designed **SORGEL Air-Cooled Transformers.** All factory assembled, wired and tested. **Mounted on a substantial steel base.** Shipped as a single unit or in sections, accurately co-ordinated for **easy assembly on the job.**

Sizes up to 2000 Kv-a. All voltages up to 15 Kv.

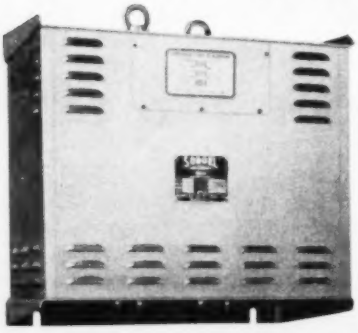
Complete Line . . . .

¼ to 2000 Kv-a.

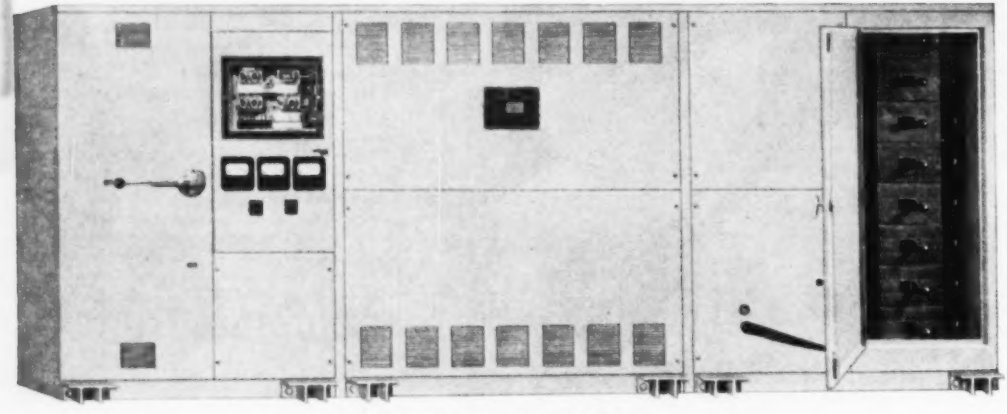
Single phase and poly-phase.

120, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and 14,400 volts

¼ Kv-a. Single phase 460/230 to 230/115 volt



20 to 50 Kv-a., 3-phase. Wall Mounting Type



500 Kv-a. 3-phase, 4160 volt Sub-Station.
With primary fused load break switch. Recording watt-hour meter with demand register. P.F. indicator, volt and ammeter. Secondary main circuit breaker and distribution panel.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled Transformers

F. R. "MAC" McVICKER OF ST. LOUIS welcomes the friendly "SHOW ME" attitude of utility folks he calls upon in Missouri and neighboring states of Indiana, Illinois and Arkansas. "My utility friends always give me a good chance to talk up the many good points of Locke insulators," reports "Mac", "but sooner or later they say 'SHOW ME' proof of what you say. This, of course, gives me a fine opportunity to show some of the wonderful service records established by Locke insulators in this area, as well as in other sections of the country. These service records always impress because they're so outstanding. Service records like these are another one of many good reasons why leading utilities put their confidence in Locke insulators."

In St. Louis, "Mac" McVicker says —

"UNION ELECTRIC COMPANY OF MISSOURI SERVICE RECORDS REVEAL WHY LEADING UTILITIES PUT THEIR CONFIDENCE IN

LOCKE

SWITCH INSULATORS"

"After 26 years continuous service in an industrial area, LOCKE SWITCH INSULATORS good enough for re-use on Union Electric 138 KV basic power loop."

reports "Mac" McVicker

"In 1951," says "Mac", "Union Electric tore down a 69 KV sub-station at Cahokia, Missouri, a congested industrial area.

"This sub-station had been built in 1926 using some 265 Locke Switch Insulators. Union Electric intended to junk all unusable equipment, since a new 138 KV sub-station was to be erected on the site. However, engineers noted that even after 26 years of continuous, uninterrupted service, the 265 Locke Switch Insulators appeared to be in excellent condition. These insulators were cleaned, high-potted and power-factor tested and the major portion of them are now being used on the new Clark 138 KV sub-station. The remainder were used in the construction of 138 KV arrester bases and for building 138 KV switches for other parts of the Union Electric system. Certainly," says "Mac", "here's another good example why leading utilities place their confidence in Locke Switch Insulators."

On next page "Mac" McVicker tells why Locke Switch Insulators often give you more than your money's worth.... →

"Mac" McVicker tells why **Locke Switch Insulators** survive and prosper in industrial area served by Union Electric Company of Missouri—

1. "Most important," says "Mac", "is protection of metal parts. Locke Permazinc galvanizing . . . a quality-controlled, double hot-dip method . . . assures the high degree of resistance required to survive industrial atmospheres.

2. "Note the uniformly smooth glazed surfaces which assure easy natural cleaning by wind and rain, and aid the insulator in maintaining its original excellent electrical characteristics."

3. "The Locke wet-process porcelain body . . . the toughest known by Locke . . . has been a standard of comparison since 1893," explains "Mac". "For this reason, Locke Switch Insulators easily survive power arcs, lightning flashovers, and rough handling."

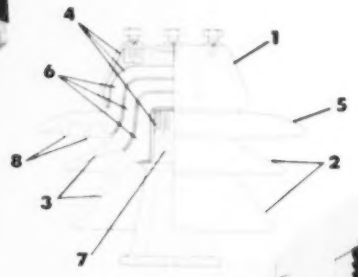
4. "Mac" points out that "the non-hardening, resilient coatings, applied to all unsanded, load-carrying surfaces, distribute loading efficiently and act as expansion joints under temperature changes. This contributes to longer life.

5. "Compression glaze . . . a Locke development . . . increases impact strength and eliminates craze to assure lasting smooth surfaces for easy natural cleaning."

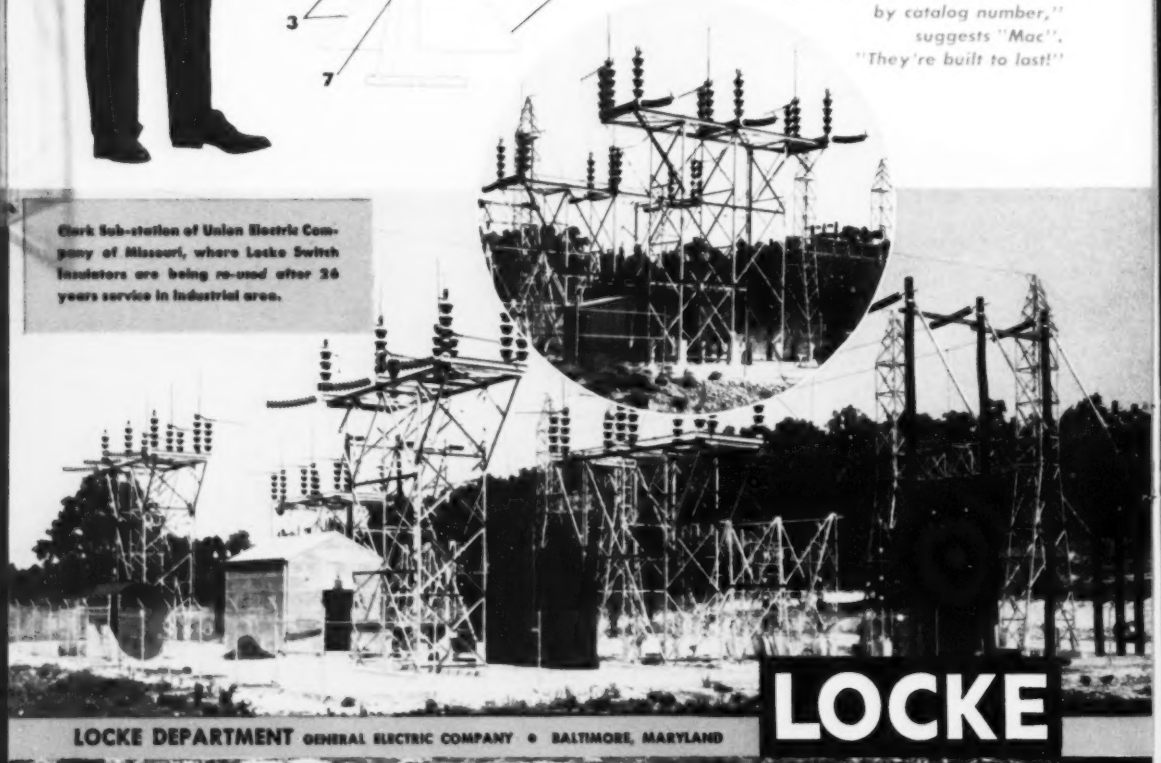
6. "Locke compression sand at the cement joints integrates the multiple shells into a permanent, high strength unit. No loose joints . . . no cracked shells," explains "Mac".

7. "The feature of vertical ribs on the inside of the caps and the outside of the pins provides high torsional strengths," adds "Mac".

8. "The contours of the corrugations," says "Mac", "have been developed to give maximum resistance to mechanical impact. Their depth assures full leakage distance."



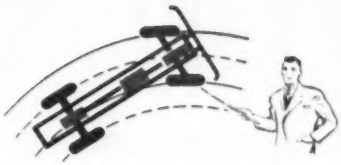
"Specify Locke Switch Insulators by catalog number," suggests "Mac", "They're built to last!"



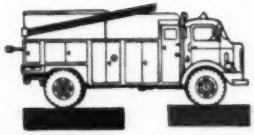
Clark Sub-station of Union Electric Company of Missouri, where Locke Switch Insulators are being re-used after 26 years service in industrial area.

LOCKE

LOCKE DEPARTMENT GENERAL ELECTRIC COMPANY • BALTIMORE, MARYLAND



Fully Compensated Drive... three free-acting differentials compensate for the difference in travel of all four wheels. Reduces drive line strains, eliminates needless tire wear.

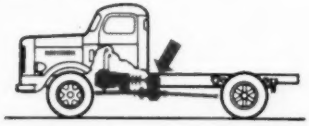


Proper Weight Distribution . . . only a true 4x4 gives you the added weight on the front wheels needed to gain the necessary traction to speed utility line work regardless of weather or terrain.

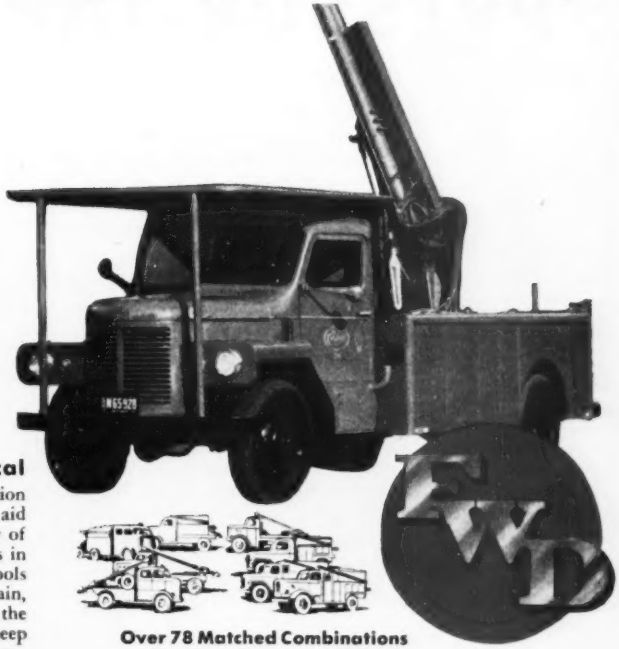
Utilities helped design 'em

. . . another reason why FWD offers all these work-speeding, cost-cutting advantages

Full Torque P.T.O. . . . utilizes full engine power through all transmission speeds. An exclusive safety lock prevents truck drive while boring operations are proceeding.



Two-Speed Aux. Transmission . . . doubles the number of transmission gear ratios. Provides low gear ratio for full power at extreme low speeds needed for tough, cross-country operations.



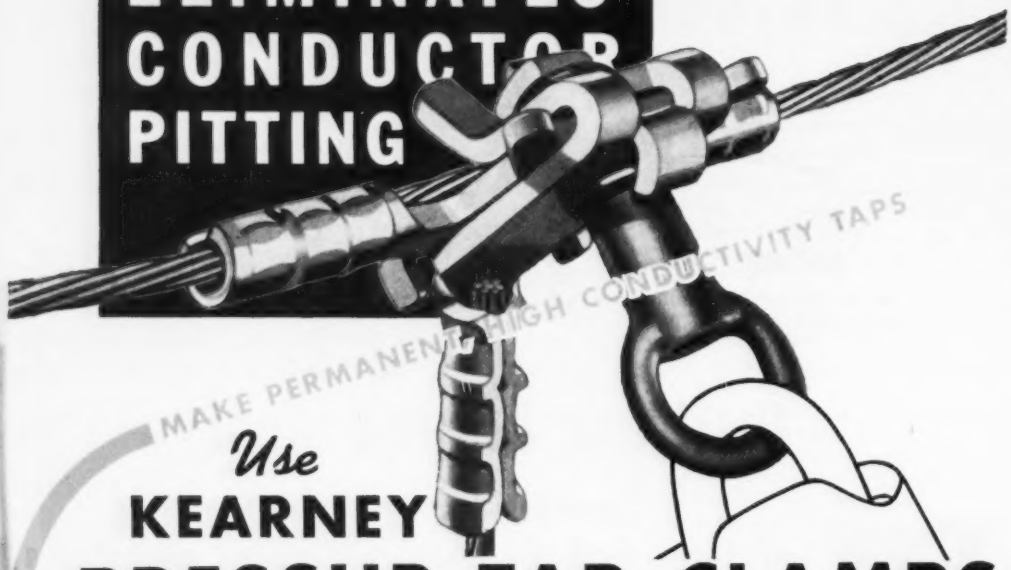
Over 78 Matched Combinations . . . Now choose the exact "mobilized tool" that meets your requirements . . . and deal with *only one* source for complete service and supply.

Faster, Safer, More Economical

FWD "mobilized tools" for line construction and maintenance were designed with the aid of utility men for utility service. This policy of *"building in"* features that you want, results in superior equipment that gets crews and tools to the job in a hurry in spite of weather, terrain, or bad footing. See your FWD Dealer to get the facts on how FWD "mobilized tools" help keep construction on schedule . . . speed service restoration . . . earn more for your equipment dollar. THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. — Kitchener, Ont.

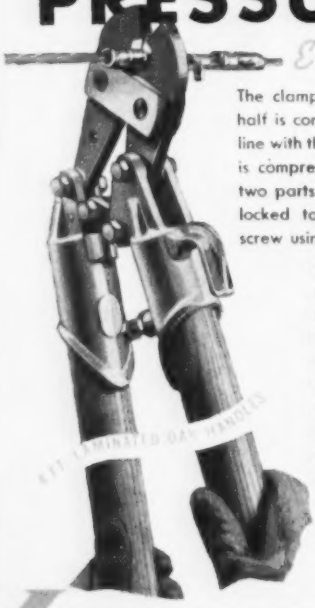
Built by the makers of America's Foremost Heavy-Duty Trucks

ELIMINATES CONDUCTOR PITTING



MAKE PERMANENT HIGH CONDUCTIVITY TAPS

Use KEARNEY PRESSUR-TAP CLAMPS



Easy to Install

The clamp consists of two parts. One half is compressed onto the energized line with the Pressur-Tap Tool; the other is compressed onto the tap wire. The two parts are then easily and quickly locked together with the large eye screw using a standard clampstick.

The new Kearney Pressur-Tap Clamp features high conductivity connections line to clamp and clamp to tap. High pressure, large area contacts minimize conductor flow; seal out corrosion between critical surfaces. Conductor pitting is eliminated because arcs, if they occur, will jump between clamp halves; not between conductor and clamp. Permanent, trouble-free taps reduce maintenance, provide uninterrupted service under heavy loads.

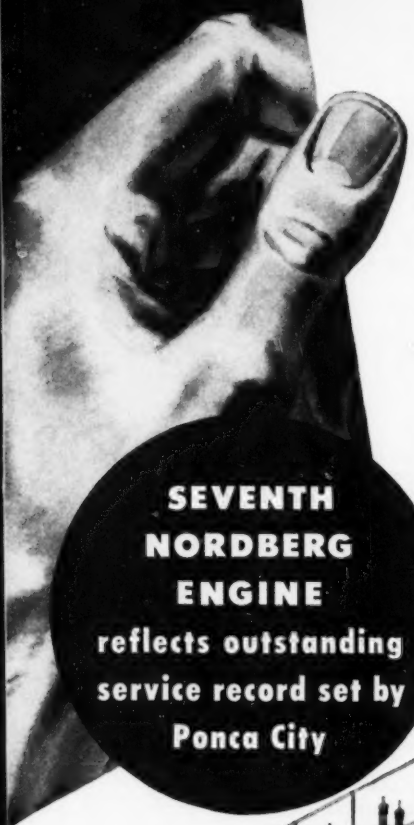
Reduce your clamp inventory. All size line and tap assemblies are interchangeable. Pressur-Tap Clamps are made of heavy aluminum metallized with copper where required. Clamps are available for any type or size conductor from #6 solid aluminum to 250 MCM stranded copper. Write today for catalog information and prices to Dept. 21.

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE., ST. LOUIS, MO.
Canadian Plant: Guelph, Ontario

207

Kearney Products

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE



SEVENTH NORDBERG ENGINE reflects outstanding service record set by Ponca City

MUNICIPAL BUILDING
CITY OF PONCA CITY
PONCA CITY, OKLAHOMA

Mr. R. W. Bayerlein
Nordberg Mfg. Co.
Milwaukee, Wisconsin

Dear Mr. Bayerlein:

Just a note to let you know that our plant is running fine. We have pulled the heaviest electric load in the history of our plant during the past three months. Hot weather hit here about June 15 and air conditioners and fans together with an increased seasonal load taxed our plant and electric system to capacity and over. We can pull roughly 7000 kilowatts with all Nordberg engines running and take care of the swings, etc. This summer we had 7300 kilowatts for hours every day and with an outside temperature of 100 to 108 degrees generating a total of 3,301,000 kilowatt hours for the month.

The 3400 hp Nordberg gas burning engine was kept on the line for 24 months non-stop 2500 Kw steady load, the other two Nordberg gas Diesels were loaded to 1350 and 1100Kw respectfully leaving 2350 Kw for the 3 old "EG" Nordberg Diesel engines. Remember one of these 800 Kw engines is 28 years old, they still pull their rated load with the original economyl.

We have certainly put these Nordberg engines on a long hard test and the results are very gratifying.

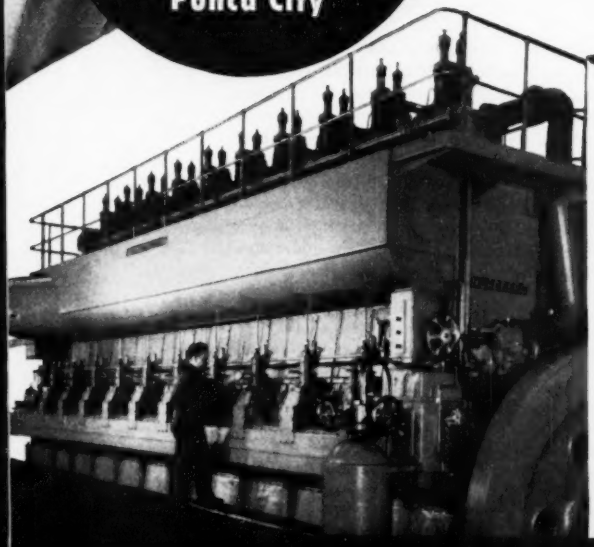
It might be of interest to know that last year our plant cost including depreciation was about 9¢ mills, this year with the increased load we are doing still better.

Yours truly,

Pat Schlesinger

PS/ma

Pat Schlesinger, Supt.



AS Mr. Schlesinger's letter points out, Ponca City, Oklahoma, has set an impressive record for dependable, economical power production . . . thanks to sound, efficient management and the reliable, low cost operation of Nordberg Diesel and Duafuel power.

Having originally installed 4 Nordberg oil burning Diesels, this progressive plant was one of the first to turn to low cost natural gas, putting into service a 2,400-hp. Nordberg Duafuel engine in 1947. Next, one of the original Diesels which had been in service since 1937, was converted and began burning gas in December, 1947. In May, 1949, a new 3,600-hp. Nordberg Duafuel engine was put on the line, which brought total plant capacity to 12,000 hp., of which gas engines made up 8,250 hp.

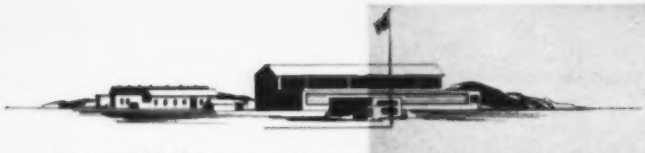
With this successful background, it was natural that when Ponca City needed more power, officials again turned to Nordberg . . . and ordered a new 4,275 hp. Duafuel unit—*their seventh Nordberg Engine.*

NORDBERG MFG. CO., Milwaukee, Wisconsin

P252

BUSCH-SULZER
A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES



From B&W Research and Development . . .

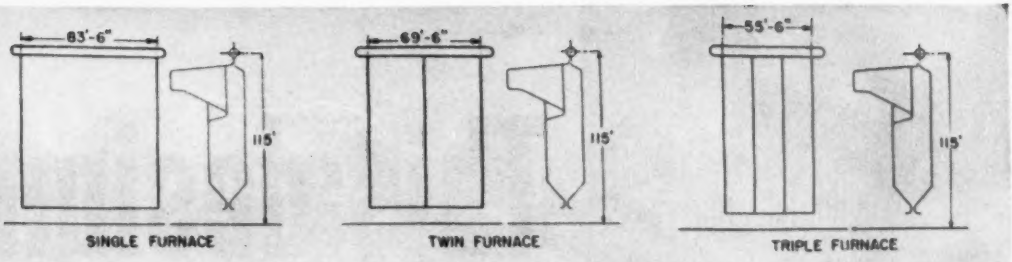
a practical solution to cost problems...

B&W DIVIDED

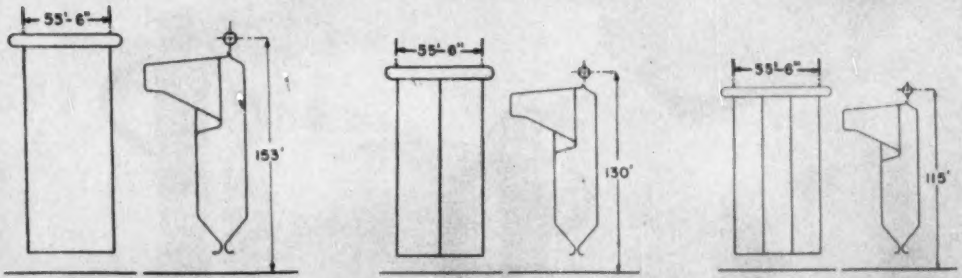
A practical, long-proved solution to rising construction costs may be found in the B&W Divided-Furnace Boiler. Whether it is a problem of conserving height, width, or both—especially for units with large heat input—B&W's Divided-Furnace design offers remarkable economies. The sketches on the opposite page show typical savings in space for twin-furnace and triple-furnace construction as compared with single-furnace construction.

A furnace division wall receives heat from both sides and therefore must be assured an adequate supply of water. With the B&W Cyclone-Steam Separator, circulation in division walls of B&W boilers has always been more than ample—as proved by long-term central station operation at boiler design pressures as high as 2650 psi. Many years of experience stand behind B&W's Divided-Furnace construction with all types of large units—Radiant, Stirling, and Open-Pass. Over 75 B&W Divided-Furnace Boilers are in operation—many for over 10 years—and more than 80 units are under construction, for the following electric utilities:

Alabama Power Company • Appalachian Electric Power Company • Arkansas Power & Light Company • Cincinnati Gas & Electric Company • City of Los Angeles • Cleveland Electric Illuminating Company • Commonwealth Edison Company • Consolidated Edison Company of N. Y. Inc. • Consolidated Gas, Electric Light & Power Company of Baltimore • Dallas Power & Light Company • Detroit Edison Company • Duquesne Light Company • Electricite France • Georgia Power Company • Houston Lighting & Power Company • Indiana & Michigan Electric Company • Jersey Central Power & Light Company • Kentucky Utilities Company • Long Island Lighting Company • Middle South Utilities, Inc. • Monongahela Power Company • Niagara-Mohawk Power Corp. • Northern Indiana Public Service Company • Ohio Edison Company • Ohio Power Company • Pacific Gas & Electric Company • Pennsylvania Electric Company • Philadelphia Electric Company • Public Service Company of Colorado • Public Service Company of Northern Illinois • Public Service Company of Indiana Inc. • Public Service Company of Oklahoma • Public Service Electric & Gas Company • Southern California Edison Company • Tennessee Valley Authority • Texas Electric Service Company • Texas Power & Light Company • Toledo Edison Corp. • Union Electric Company • West Penn Power Company • Wisconsin Power & Light Company



EFFECT OF DIVISION WALLS ON BOILER WIDTH—KEEPING HEIGHT CONSTANT



EFFECT OF DIVISION WALLS ON BOILER HEIGHT—KEEPING WIDTH CONSTANT

FURNACE

Division wall furnace construction is used in combination with other significant achievements of B&W Research and Development, including the Cyclone Furnace, Pressure-Firing, Gas Recirculation, and improved alloys for high steam temperatures. Widely accepted throughout the power industry, these modern B&W advances are making major contributions to more economical and reliable steam generation.

B&W's continuing program of progressive research combined with its broad experience in designing and building boilers with the highest capacities in existing pressure-temperature ranges, assure you of the most efficient and economical solutions to your specific steam generation problems.

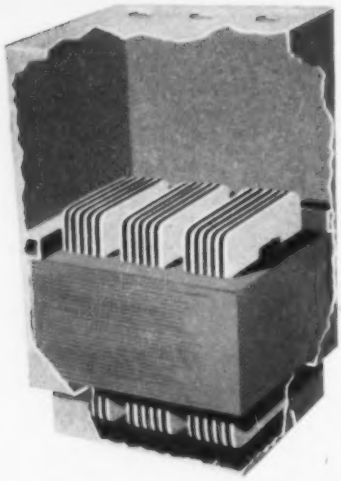
ADVANTAGES OF DIVIDED FURNACE CONSTRUCTION

- Provides greater cooling area without increasing furnace volume
- Reduces steel and other material costs by keeping boiler and building volume to a minimum
- Lowers furnace construction costs
- Cuts operating costs by reducing slagging in furnace and in convection surface

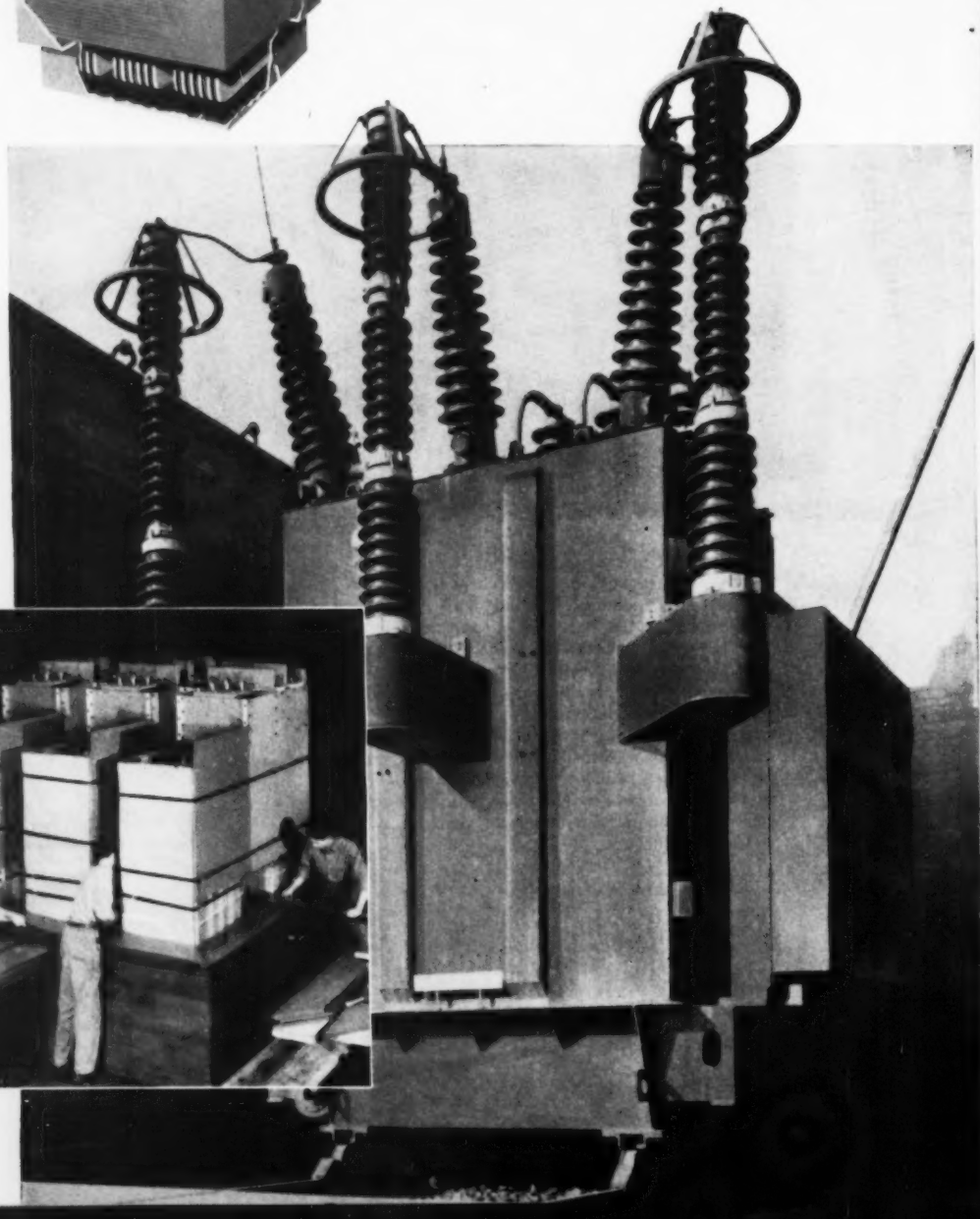
Triple furnace boilers for 1 boiler—1 turbine units of over 200,000 KW capacity are now being constructed

BABCOCK & WILCOX

G-5697



This design



takes stress better

The Form-Fit design of Westinghouse Power Transformers has inherent advantages that no other transformer can equal for handling both surge and short-circuit stresses.

The fact that the winding contains only a few coils of large plate area, results in the best relationship between series capacitance and ground capacitance and gives, inherently, more uniform distribution of lightning surge across the winding. This construction eliminates the need for shields, arresters or other internally mounted protective devices likely to cause trouble. As a result, operating hazards are minimized . . . design margins and safety factors are increased.

Because short circuits set up, in all transformers, magnetic fields that tend to force high and low-voltage coils apart, Westinghouse Form-Fit Transformers are arranged with high and low-voltage coils interspersed, so that these forces, acting over broad areas, essentially balance each other and are reduced to absolute minimums. Furthermore, because the core surrounds, supports and protects the coils, the mechanical strength of the mass of core material is added to the strength of the case, providing an unbeatable combination to withstand all mechanical stresses.

To all this, add the advantage of more efficient cooling, and the saving in installation cost because they are smaller and lighter than any comparable transformer, and you'll quickly see why it pays to specify Westinghouse Form-Fit Power Transformers.

Ask your Westinghouse representative for further information, or write for Booklet B-4142A: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70643

YOU CAN BE SURE...IF IT'S
Westinghouse
POWER TRANSFORMERS

50,000-kva, 132-kv transformer installed at West Penn Power Company's Mitchell Station.

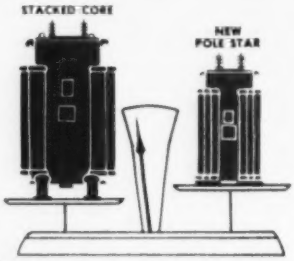
NOW..POLE STAR TRANSFORMERS

Pennsylvania's four new Pole Star distribution transformers are fundamentally the same as the original 3 to 100 Kva Pole Stars. Cores are wound of oriented electrical steel with core laminations individually lapped for low exciting current. In every Kva rating, the Pole Star is lighter in weight and smaller in size than the stacked core transformer it replaces. It is more economical to operate, less costly to store, and easier to install.

In Short, The Pole Star is a Better Transformer . . . Operating with *Greater Efficiency* and at *Less Cost*

167 Kva

Exciting Current reduced 75%



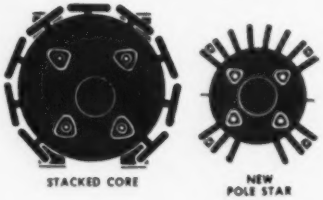
Weight reduced 2200 pounds

Compare

THE NEW 500 Kva POLE STAR WITH THE OLD 500 Kva STACKED CORE TRANSFORMER

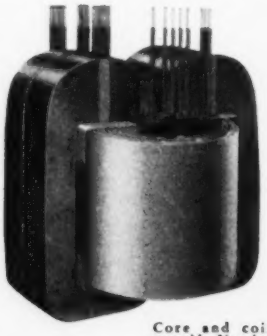
Oil Volume reduced 35%
125 gallons

Floor Area reduced 20%



LOW CORE LOSS—AN OUTSTANDING FEATURE OF THE POLE STAR

Pole Star cores are carefully annealed in controlled-atmosphere furnaces, but do not suffer the disadvantages of adhesions. That is because when the core is assembled through the coil, the laminations are separated from each other. The absence of adhesions between laminations and the presence of high interlamination resistance keep the core loss at a low value.



Core and coil assembly. Note lap joint at top of core.

For complete information on the 167 to 500 Kva Pole Stars, write to Pennsylvania Transformer Co., Canonsburg, Pa.

PENNSYLVANIA TRANSFORMER

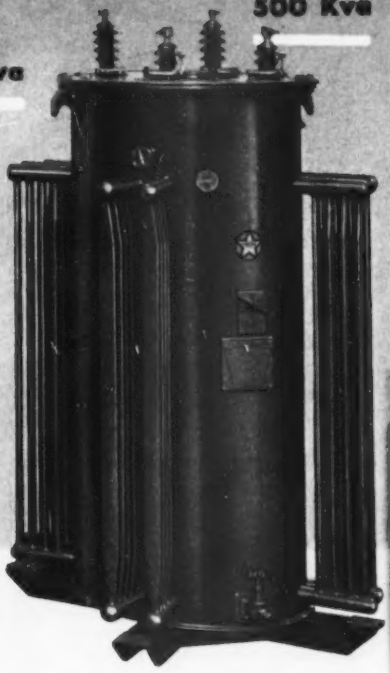
BOX 330 • CANONSBURG, PENNSYLVANIA • GREATER PITTSBURGH DISTRICT

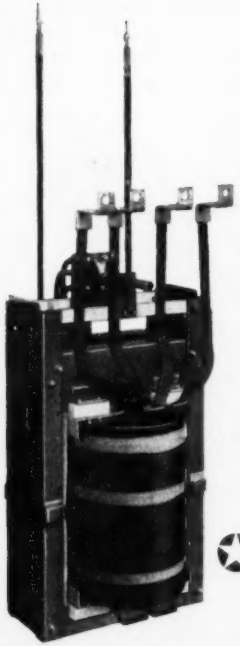
IN SIZES UP TO 500 Kva

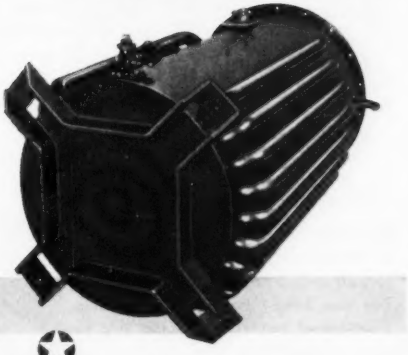
250 Kva

333 Kva

500 Kva







NEW BASE FEATURES CROSS VENTILATION

Structural steel bars are welded to the tank bottom. Their arrangement permits the transformer to be rolled in any direction. Jack lugs extend beyond the tubes or radiators. Openings provide cross ventilation for the tank bottom and the base. The entire tank bottom is accessible through the openings for painting.

INTERNAL ASSEMBLY OF 167 KVA POLE STAR

Side frames completely enclose the core and provide a sturdy support for the entire unit. The Pole Star coil is designed for a low temperature gradient and a high overload capacity. Large oil ducts are provided throughout the coil.

CORE BUILDER ASSEMBLES LAMINATIONS THROUGH 500 KVA POLE STAR COIL

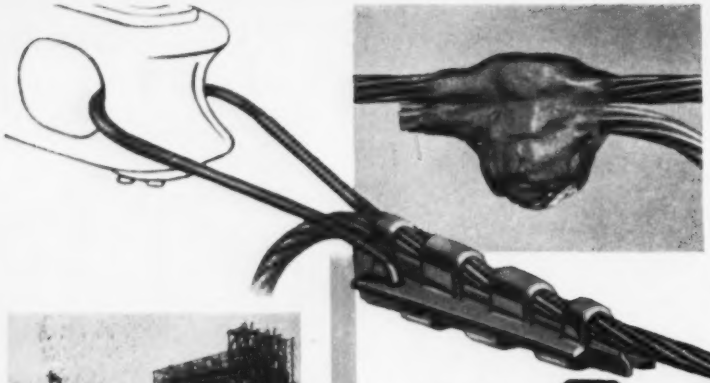
Core laminations are individually lapped. There are no gaps or butt joints in the Pole Star core to cancel out the advantages of the cold-reduced, oriented electrical steel. The lapped construction reduces the flux density at the joint and maintains the low reluctance path of the Pole Star core.

Ask for free Catalog No. 352

COMPANY

Pennsylvania TRANSFORMER

Product Of Long Experience
Safe, Thrifty And Reliable



NEW

AIRSEAL

Easy to apply, Kearney Airseal protects connections. Eliminates high resistance corrosion by sealing out moisture and contaminated atmospheres. An inert, pliable material, it has extremely high dielectric strength (280 volts/mil).

KEARNEY 34.5 KV TEST SUBSTATION

Kearney products are field-proved under actual operating conditions. At our substation laboratory, engineers subject production line samples to exhaustive tests in order to guarantee you trouble-free performance out on the line. Rigorous standards must in every case be met or exceeded before a new product receives approval.

You benefit directly from our proving ground. You can be absolutely sure of our certified ratings. For example, when we tell you that a particular catalog number cutout has a certain interrupting capacity, you can count on that figure. It will not be the result of theoretical calculation or estimation . . . it will be an actual, proved performance rating with extensive test records to back it up.

This certified rating is an added guarantee of Kearney quality. In every case it will not be merely an advertising claim but a professional engineering statement of test results. It will deserve your confidence. For year-in, year-out trouble-free operation, specify Kearney products. The certified rating is your warranty that they are designed and built to do the job.

SERVICE CABLE TIE

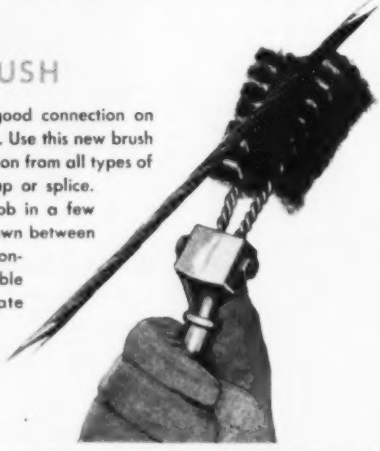
For use with the bare neutral, self-supporting type of service cable, this troublesaver laces the conductors tightly together preventing separation at dead-ends. Quickly installed with the fingers, the soft aluminum tie will not fray like tape nor damage insulation.

WEDGE-TITE CLAMP

This new Kearney clamp is designed to dead-end the bare neutral type of service and secondary cable at either the house or the pole. Of easy-to-handle one piece construction, a serrated wedge grips the neutral with a force proportional to the strain put upon it. Does not transmit tension to insulated conductors thus preventing insulation creep with its dangers of leakage and shorts.

CLEANING BRUSH

It is impossible to make a good connection on dirty or oxidized conductor. Use this new brush to scuff up and remove corrosion from all types of line wire before making a tap or splice. Sturdy steel bristles do the job in a few short strokes. Cleans deep down between strands without damage to conductor. Adjustable, replaceable brush elements accommodate any size wire.



JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

The Mark of Quality Products

Specify KEARNEY

JAMES R. KEARNEY CORPORATION

KEARNEY PRODUCTS

designed to help do a Better Job Faster

Profit... or loss for a power company depends largely on three questions. (1) How fast can we do a particular job? (2) How long will it last? (3) How much maintenance will it need?

Kearney engineers, because most of them have been operating engineers, know how important these questions are. They have designed the accessories shown on these pages to do a job fast ... to make it last... without maintenance.

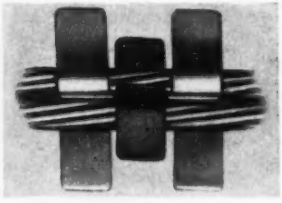
Small items... inexpensive items, but all very important in today's high-cost operation. Use them to reduce expenses; increase profit. Make a place for them on every line truck.

RUST CUTTER

Fast acting Kearney Rust Cutter saves time wasted in sawing off rusted ferrous nuts, bolts or other hardware. Simply spray chemical from self-contained, pressurized can. Atomized mist dissolves hard-to-get-at corrosion and loosens frozen part.

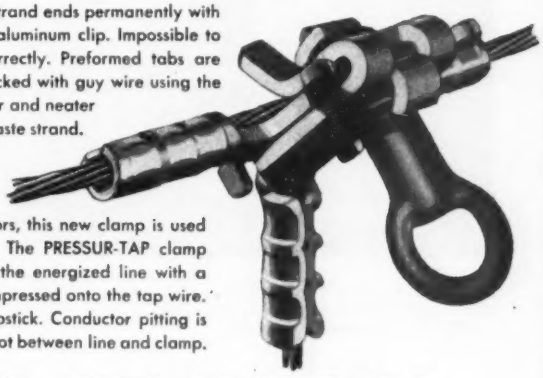
NON-STATIC GROUND WIRE CLIP

Eliminates a major cause of radio and television interference. Prevents air gaps between ground wire and clip. Pressure between wire and clip remains constant even if clip should loosen in wood. Inexpensive to buy, quick and easy to install with a hammer as shown above.



FINGER GRIP GUY CLIP

Serve guy strand ends permanently with this new aluminum clip. Impossible to position incorrectly. Preformed tabs are easily interlocked with guy wire using the fingers. Faster and neater than using waste strand.



PRESSUR-TAP CLAMP

Designed for any type or combination of conductors, this new clamp is used for making permanent, high conductivity taps. The PRESSUR-TAP clamp consists of two parts. One half is compressed onto the energized line with a hot line tool resembling a bolt cutter; the other is compressed onto the tap wire. The two parts are then joined together with a clampstick. Conductor pitting is eliminated because arcing is between clamp halves, not between line and clamp.

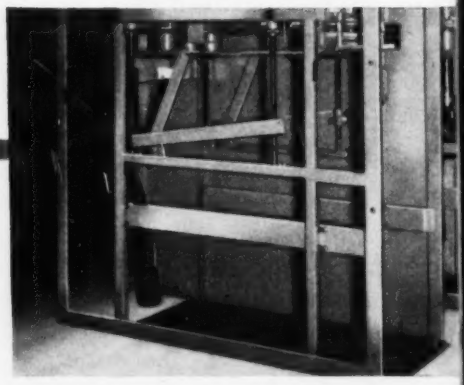
PRODUCTS

206

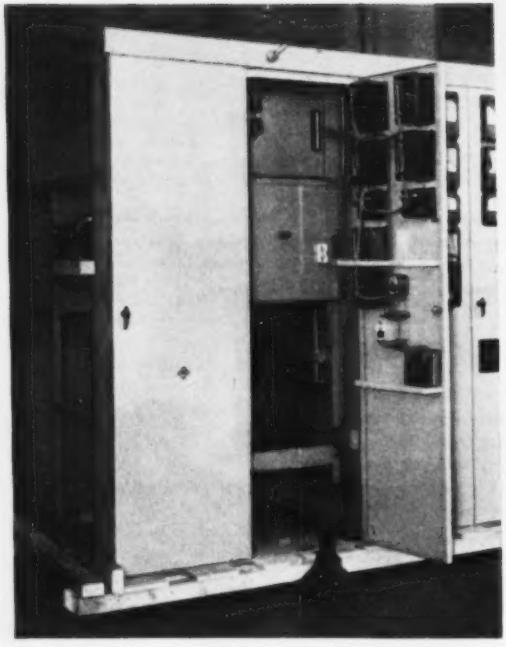
4224-42 Clayton Ave., St. Louis, Mo. ***Canadian Plant:*** **Guelph, Ontario**

Simplifies

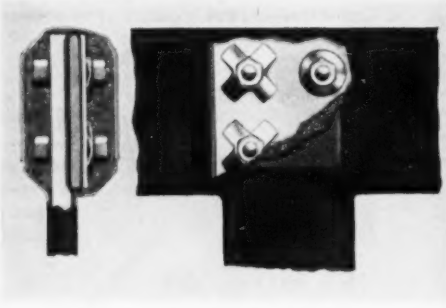
METAL-CLAD Switchgear



PLACING Switchgear over floor cable is done without lifting cubicles because A-C engineers designed the cubicle in such a way that it simply slides into place.



MOVING is an easy job even if there's no crane or overhead space. Installation-wise A-C engineers built in provision for jacking all indoor Switchgear units.



JOINING buses need no longer be a long, time-consuming job. Joint is bolted; then, no-corona tape is placed over bolt heads and nuts. Next, a molded Neoprene boot is slipped over the joint and taped in place. No fuss, no muss, no liquid compounds.

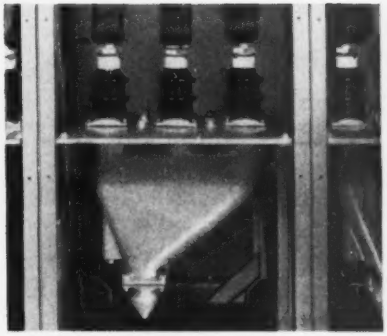
ALLIS-CHALMERS

Installation!

Here are six ways you eliminate costly, time-wasting steps in installation using Allis-Chalmers switchgear.

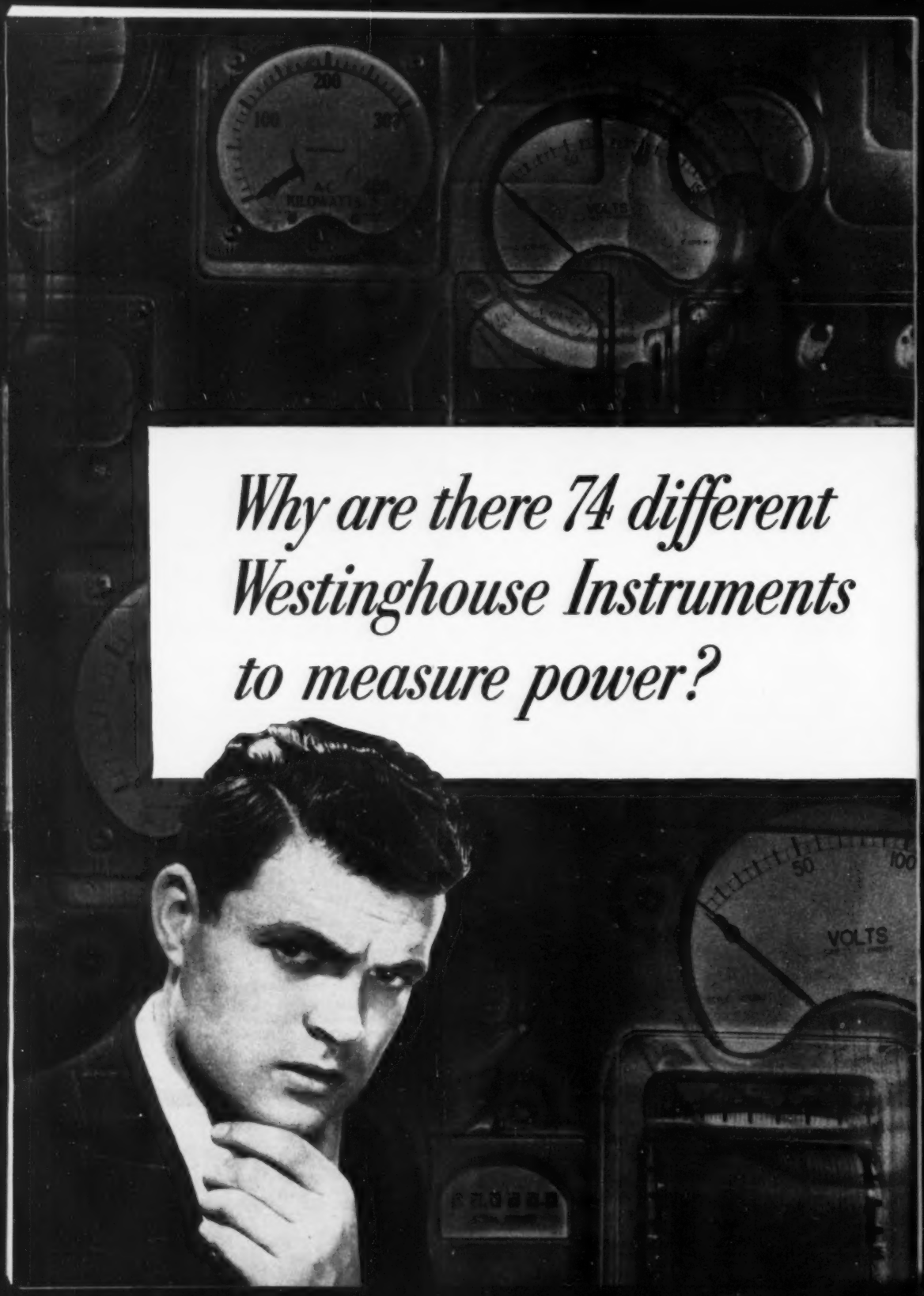
INSPECTING contacts and arc chute during and after installation is only a three minute job with latest Allis-Chalmers circuit breaker. Only one nut to take off and all barriers can be lifted right out.

ALIGNING is easy. Allis-Chalmers builds every removable element and every stationary element to master jigs. This simplifies installation, and makes all units of same rating interchangeable.



INSTALLING a pothead can be done out in the open where there's plenty of room. After that it is simply pushed into place and bolted. No crossbars prevent swinging the pothead into place.

THESE are only details, but they do tell a story of careful engineering. It will pay you to find out more about Allis-Chalmers Switchgear. Call your nearby A-C District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3888



Why are there 74 different Westinghouse Instruments to measure power?

If you produce a product

The wider choice you get in Westinghouse Instruments offers you new opportunities to improve your product's performance, appearance, salability. Whether you want to measure amperes, volts, watts, vars, power factor, frequency or synchronism, there's a Westinghouse Instrument to meet the precise requirements of your customers. And the performance of *all* Westinghouse Instruments meet ASA Standards.

pilot a plant

If your job is supervision of production or plant operation, getting just the *right* instrument can help you gain closer control of a process or more efficient operation of plant facilities. Moreover, Westinghouse offers you competent application assistance to help you employ instruments most effectively

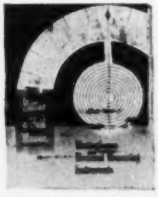
or probe the unknown

If your job is research, this complete line of instruments serves all your needs for the measurement of electrical values. The diversity of types, for any given measurement, includes many variations in size, types or mounting, types of scale, range, accuracy and styling, as well as instruments to measure position, time, temperature and speed.

you gain benefits like this:

Take the case of a leading electronic equipment manufacturer. They needed to equip tube test stations with a variety of instruments having co-ordinated styling for best appearance; small enough to permit close grouping and accurate enough to serve as "standards". Standard Westinghouse Instruments answered every requirement! Next time *you* need instruments to improve a product, perfect a process or probe a problem . . . specify Westinghouse!

J-40419



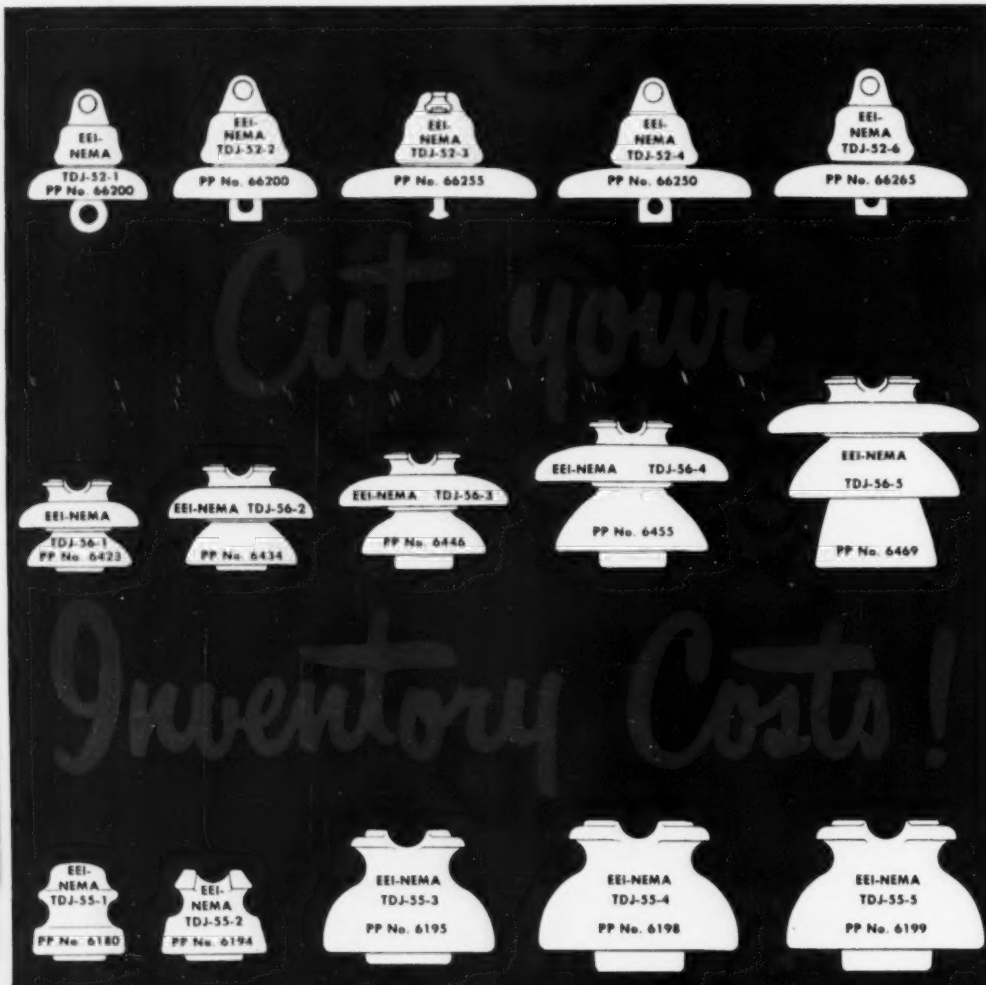
For complete information about Westinghouse Instruments, write for Booklet B-4696. Address: Westinghouse Electric Corporation P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE... IF IT'S

Westinghouse

INSTRUMENTS

PORCELAIN PRODUCTS' EEI-NEMA STANDARD INSULATORS


EEI-NEMA TDJ-52-1 PP No. 66200
EEI-NEMA TDJ-52-2 PP No. 66200
EEI-NEMA TDJ-52-3 PP No. 66255
EEI-NEMA TDJ-52-4 PP No. 66250
EEI-NEMA TDJ-52-6 PP No. 66265
Cut your
EEI-NEMA TDJ-56-1 PP No. 6423
EEI-NEMA TDJ-56-2 PP No. 6434
EEI-NEMA TDJ-56-3 PP No. 6446
EEI-NEMA TDJ-56-4 PP No. 6455
EEI-NEMA TDJ-56-5 PP No. 6469
Inventory Costs!
EEI-NEMA TDJ-55-1 PP No. 6180
EEI-NEMA TDJ-55-2 PP No. 6194
EEI-NEMA TDJ-55-3 PP No. 6195
EEI-NEMA TDJ-55-4 PP No. 6198
EEI-NEMA TDJ-55-5 PP No. 6199

You can effect real savings on reducing your inventory, handling costs and record keeping by using the new EEI-NEMA simplified standards on transmission and distribution insulators. We keep your inventory for you! Each of these insulators is in continuous production for prompt shipment. Porcelain Products offers you these insulators in:

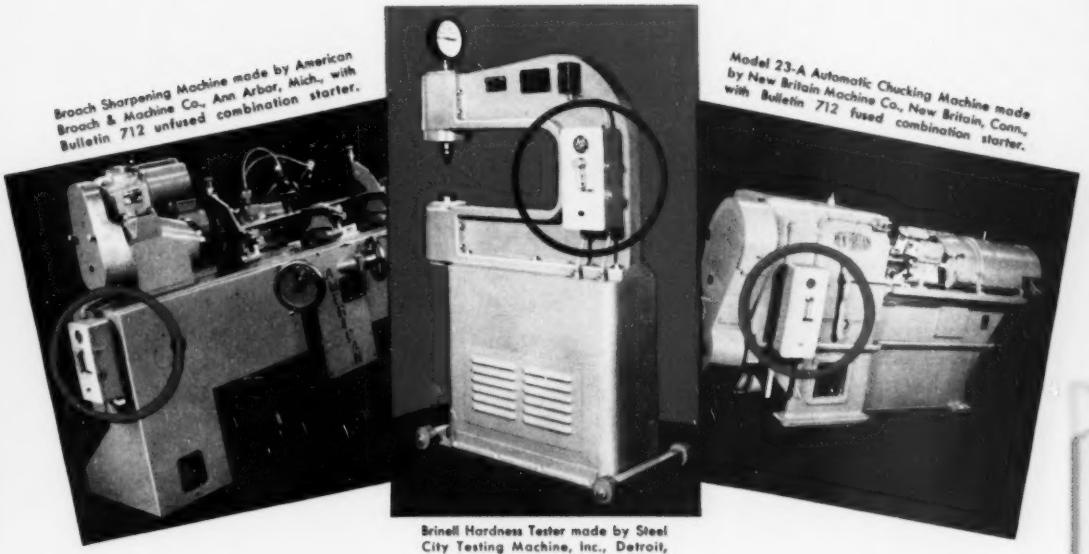
1. Superior quality backed by the finest equipment available and quality control standards.
2. Superior workmanship backed by long training and service.
3. Superior design backed by top engineering talent and tests.

Pintype insulators are now produced with larger tie-wire and conductor grooves in accordance with latest standards to accommodate larger size conductors coming into greater use. Ask us for complete details. No obligation.

YOUR INSULATOR MFGR.

Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA



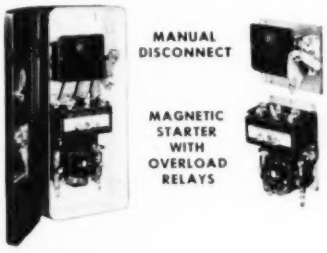
Broach Sharpening Machine made by American Broach & Machine Co., Ann Arbor, Mich., with Bulletin 712 unfused combination starter.

Brinell Hardness Tester made by Steel City Testing Machine, Inc., Detroit, Mich., with Bulletin 712 unfused starter.

Model 23-A Automatic Chucking Machine made by New Britain Machine Co., New Britain, Conn., with Bulletin 712 fused combination starter.

SIMPLIFY YOUR CONTROL INSTALLATIONS

by using A-B Combination Starters



BULLETIN 712 COMBINATION STARTER

The above illustrations show how the Allen-Bradley combination starter with manual disconnect unit is arranged either for open or enclosed mounting.

An important feature is the mechanical interlock between the operating lever on the outside of the cabinet and the disconnect unit. The cabinet cannot be opened until the disconnect lever has been moved to open the disconnect switch. The magnetic switch is "dead" when the door is open . . . a valuable safety feature.

A great many machine tools need merely an automatic across-the-line starter and a disconnect switch. For such machines the ideal control unit is an Allen-Bradley combination starter . . . with starter and disconnect in one compact cabinet. Installation cost is less, too.

Look at the above well-known machines. See how neat and compact is the control unit . . . just one Bulletin 712 combination starter.

These A-B combination starters provide reliable overload protection for the motor. An overloaded motor is disconnected automatically and cannot be started until the overload is cleared.

Bulletin 712 combination starters have a manual disconnect switch, fused or unfused. Bulletin 713 starters have an instantaneous circuit breaker. For wet, dusty, or hazardous locations there is a complete line of safety enclosures that protect starter and safety switch or circuit breaker from water, dust, and explosive fumes. Let us send you Bulletin 712-713.

7-52-M

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

A-B

ALLEN-BRADLEY

COMBINATION STARTERS

QUALITY

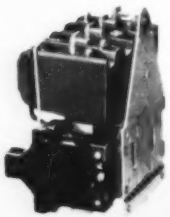
INDIVIDUALIZED
MOTOR STARTERS
for this
10-SPINDLE WIRE INSULATING MACHINE

BULLETIN 709 FORM 1 STARTER has start and stop push buttons in cover. Saves space, eliminates conduit and wiring, and makes a neater wiring installation.

CLOSE-UP OF PUSH BUTTON. Start and stop push buttons are a self-contained unit mounted in a small bakelite housing.

NO CONTACT MAINTENANCE. Allen-Bradley double break, silver alloy contacts are good for long maintenance free operation. Never clean, file, or dress them.

DEPENDABLE OVERLOAD RELAYS. A-B thermal overload relays trip automatically and disconnect an overloaded motor. They prevent motor burnouts.

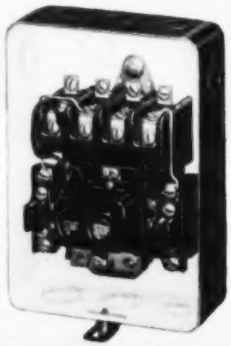


Each spindle of this 10-spindle American Insulating Machine is a separate operating unit . . . with its own motor drive and its own control. By using ten Allen-Bradley Bulletin 709 Form 1 starters . . . with push buttons in the cover . . . flexible and convenient control is obtained at minimum cost for all spindles.

Since there are no external push buttons, no auxiliary control wiring is needed, which results in a greatly simplified and neater conduit and wiring installation.

Two overload relays in each starter are perpetual watchdogs, which will instantly stop the motor, automatically, if an overload occurs.

As for control maintenance, there is none when you install Allen-Bradley solenoid starters with silver alloy contacts. For more details, please write for Bulletin 709.

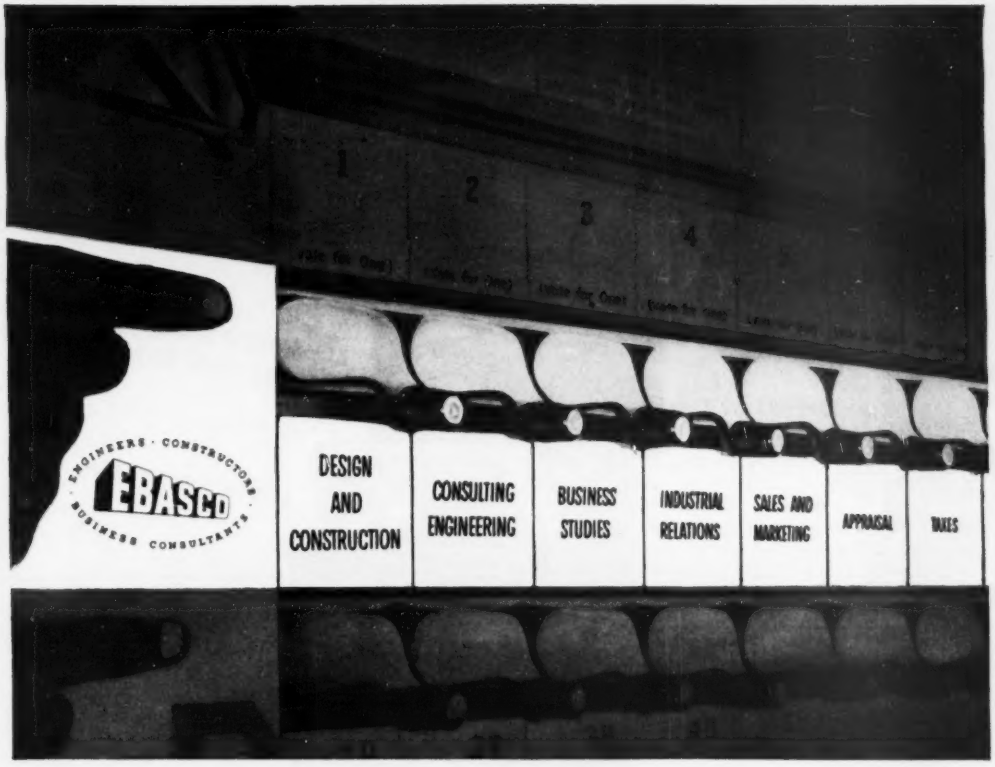


EASY TO INSTALL. Bulletin 709 starters have bonderized cabinets with white interiors that make installation easy in dark corners. Plenty of knockouts, too.

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY

7-52-M



top ticket for top management

These days more and more management men are choosing EBASCO to help them solve their special problems . . . problems that range all the way from the initial planning of a business to those which occur during actual operations. In addition, they find that EBASCO is flexible. They can "vote the full EBASCO ticket" (as many companies do) or they can select one or more services their business currently needs.

EBASCO engineers, constructors and business consultants are men with the skills and training not always available in today's tight manpower market. Their technical abilities are at your company's disposal without adding to your permanent payroll.

EBASCO's background covers half a century of business progress. During this time the organization has helped companies install pension plans, set up inventory and control systems, and improve sales and marketing methods. It has assisted in new financing amounting to more than two billion dollars. In the field of construction, EBASCO has designed and built more than a billion dollars worth of new plants.

This background—and what it means to your company—is more fully outlined in "The Inside Story of Outside Help." We will gladly send you a copy on request. Address Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

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Traffic
Washington Office

EBASCO TEAMWORK GETS THINGS DONE ANYWHERE IN THE WORLD **EBASCO SERVICES**
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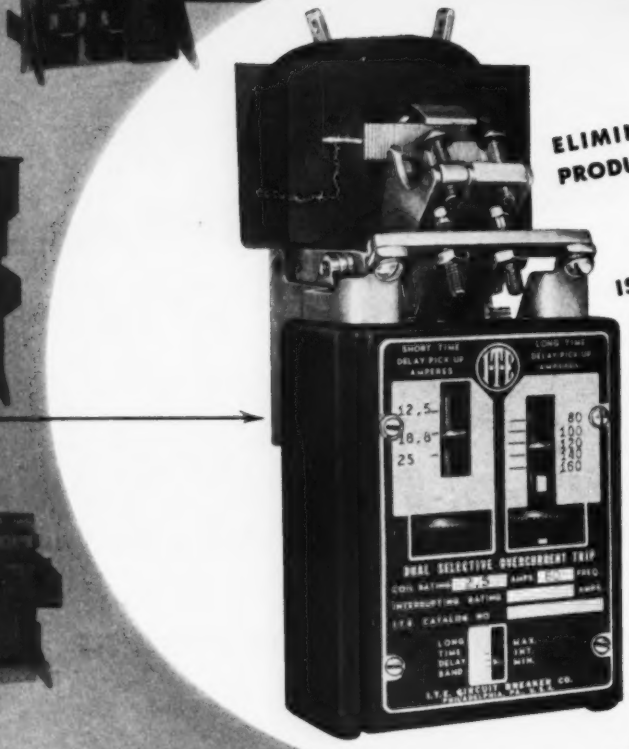
NEW YORK · CHICAGO · WASHINGTON, D. C.

SERVICE CONTINUITY



ELIMINATES COSTLY PRODUCTION BREAKDOWNS

ISOLATES SYSTEM FAULTS

SAVES UP TO 63% ON INITIAL INVESTMENT

Direct-Acting Selective Overcurrent Trip Devices are available for I-T-E KA, KB, KC, and LG type circuit breakers in the following ratings:

15,000 to 100,000 amperes interrupting capacity

100 to 6000 amperes continuous

MODERN I-T-E DIRECT-ACTING SELECTIVE TRIP BREAKER PROTECTION

It's easy to protect production and profits against disastrous total power failure in complex electrical distribution systems. The cost is lower than you think.

Modern Selective Tripping—pioneered and developed by I-T-E—eliminates the failings of inadequate systems which can tie up an entire plant or utility with a single short somewhere along the line.

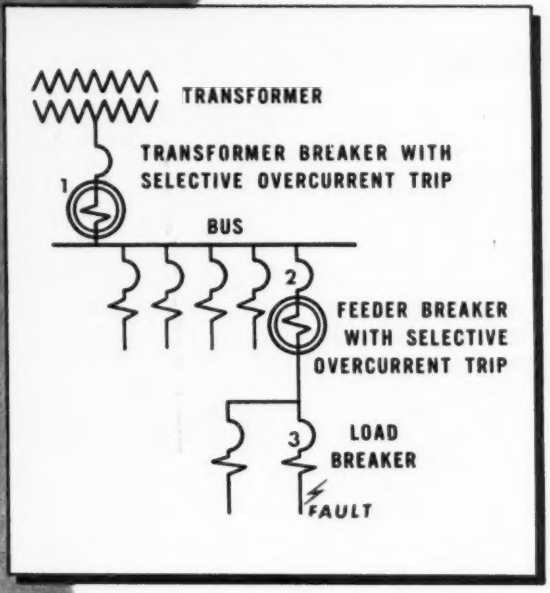
Selective Tripping limits the fault to *one* affected area only. Production continues—*uninterrupted*—throughout the rest of the system.

I-T-E TRIP DEVICE SAVES 63% ON INVESTMENT

Secret of this efficient delayed-action circuit breaker protection is the I-T-E *Direct-Acting* Selective Overcurrent Trip Device. Developed by I-T-E engineers to replace complex, expensive transformer-relay auxiliary apparatus, this unique tripping device gives one more reason for I-T-E leadership in the design and application of quality circuit breakers and switchgear.

Positive—compact—dependable, the low-cost I-T-E Trip Device saves you up to 63% on accessory cost per circuit! And because it is a *direct-acting* device—an integral part of the circuit breaker—no additional space is required on your switchboard panel. Assure service continuity. Install I-T-E Selective Tripping in *your* plant.

COSTS LESS THAN YOU THINK



HOW SELECTIVE TRIPPING WORKS

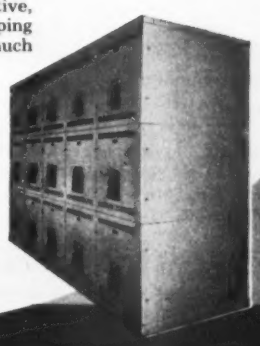
I-T-E circuit breakers, arranged in series, are *preset* to open in *definite sequence* (3, 2, 1 in diagram). If there is a sudden overcurrent or short circuit in any branch of the system, only the breaker (3) closest to the fault will open. Other breakers—other production machinery—in the system are unaffected.

ANOTHER I-T-E "FIRST"

Here is one more I-T-E "first"—another major I-T-E development to help industry protect production and save. Originally developed for the Navy during the War, the I-T-E Direct-Acting Selective Overcurrent Tripping Device has since been refined and perfected for industrial and utility use.

Call on I-T-E engineers—specialists in circuit breakers and switchgear—to see how positive, dependable I-T-E *Direct-Acting* Selective Tripping can protect your plant operation. See how much you can save.

For selection and application data on I-T-E large air circuit breakers, including selective tripping arrangements write for Catalog Section 1003 today. I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Phila. 30, Pa.



I-T-E

LOW-VOLTAGE SWITCHGEAR

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In every city and state there is a well defined preference for Orangeburg STANDARD, installed with concrete where banks of three, four or more ducts are required. Orangeburg STANDARD is widely used by utilities, municipalities and industry. For 58 years it has been a favorite of design engineers and contractors everywhere.

Quality, dependability and profitable ease of installation has won for Orangeburg STANDARD nationwide approval.

STANDARD Installed with Concrete

No special tools needed

Orangeburg is easily worked in the field, easily sawed, easily tooled with an inexpensive lathe. Long light lengths saves time—speeds up the job.

Taper-Sleeve Joints stay tight

The joints are surprisingly easy to make. A few light hammer taps drive them up tight. Corrosive ground waters do not enter. These Tapered Sleeve Joints are famous because they stay tight permanently.

Less Breakage

Orangeburg is tough, resilient and rugged—seldom breaks when handled with ordinary care. This is added insurance of a good profit—without little losses to write off.

Bigger Payloads

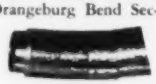
Big capacity truck loads of Orangeburg are easily hauled without damage – and with fewer trips. The transportation costs are low – the job is speeded up – and the final costs are less.

Outstanding Features

Orangeburg lays faster and at lower cost than any other type of conduit. Impermeable wall and tight joints keep out corrosive ground waters • Low coefficient of friction keeps pulling tension on cable to minimum • Protects cable sheath from abrasion when pulled in • Resists acids, alkalies, salt, grease and oil • Light, easy to handle and tool in the field.

Send for Bend Section Folder

This shows ingenious ways to get around trouble spots with Orangeburg Bend Sections. Folder sent FREE on request.



New Catalog 51 is also available. Write to Dept. EW-7 for this folder which tells the story of Orangeburg Fibre Conduit – both STANDARD and NOCRETE. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.

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MITI-MITE

(MODEL 55)

will change your ideas about what a truck crane can do!

If you want a *better* way to handle 101 jobs — faster, at less cost — then the Miti-Mite is for you!

Here's power . . . strength . . . and stability to let you work at full capacity — put more on the hook — dig faster — swing faster.

And here's amazing simplicity! The entire machine is built around a rugged power box. It's the automotive idea of a large transmission case with all parts running in oil. It operates for long periods with little or no attention — requires far less lubrication and servicing than any machine of this type you've ever known.

Mount Miti-Mite on any make of truck with suitable capacity. Convert it quickly for service as shovel, crane, dragline, clam shell, trench hoe or magnet. See it now, or ask for literature.

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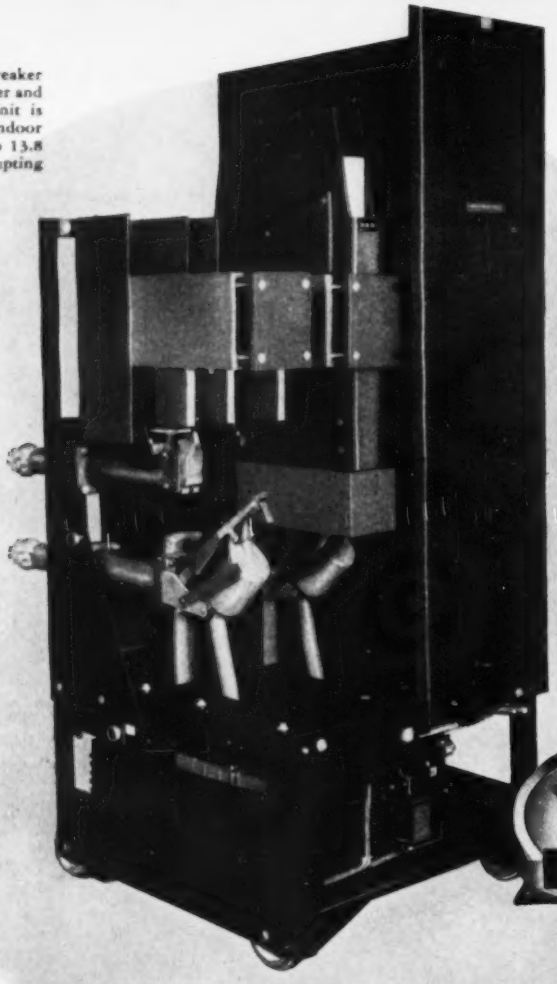
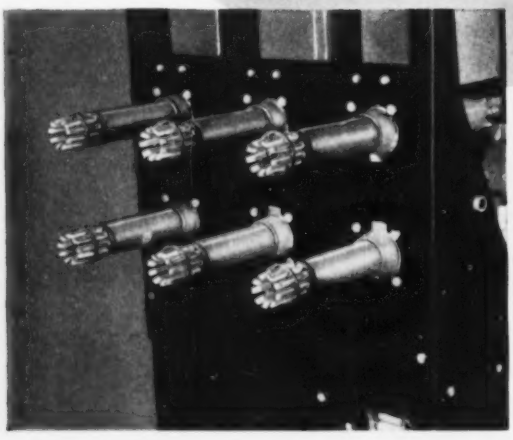
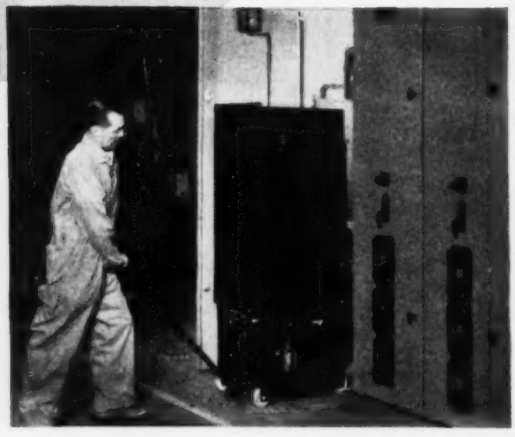
150-DH-250 Air Circuit Breaker with half of interphase barrier and one arc chute removed. Unit is horizontal drawout—for indoor and outdoor service 4.16 to 13.8 kv—150 to 500-mva interrupting rating.



DESIGN TESTED & VERIFIED
In the
Westinghouse
HIGH POWER LABORATORY



Positive contact is obtained on primary disconnects by individual flat springs and heavily silvered, self-aligning, finger-like segments. Segments on breaker are easy to inspect.



Horizontal-drawout feature makes it easy to place breaker into operation. Two-surface wheels which ride on track in stationary structure assure perfect alignment for engaging contacts.

The DH De-ion® breaker design pays performance benefits

IN EVERY PHASE OF METAL-CLAD SWITCHGEAR OPERATION!

Here's how the Westinghouse DH Air Circuit Breaker for Metal-Clad Switchgear gives you the kind of performance you want . . .

Fast, positive, arc interruption . . . DH Air Circuit Breakers employ the De-ion® principle of arc interruption—the most efficient method of arc extinction in use today. The De-ion principle is a Westinghouse exclusive! The true ceramic material used in constructing the arc chutes provides unusually high resistance to heat shock.

Simple, effortless operation . . . DH Breakers are the horizontal-drawout type. No lowering or lifting is necessary. There's no complicated mechanism to require frequent inspection or maintenance. Breakers are drawn straight out from disconnected position . . . require only a few easy turns of a crank to move into operating position.

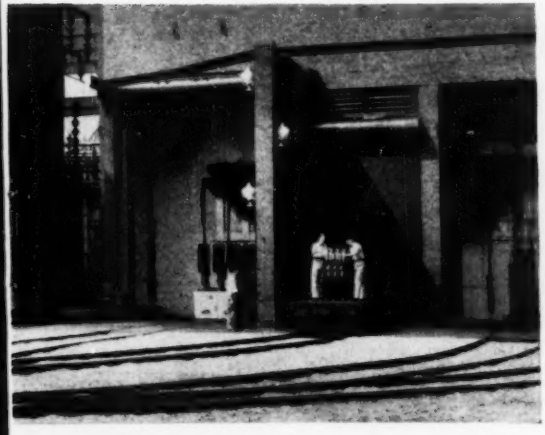
Easy inspection and maintenance . . . Breaker interphase barriers can be removed by simply loosening holding bolts. Arc chute removal—just as simple—exposes contacts at an accessible and convenient working height for quick inspection and maintenance. High-pressure, finger segments located on breaker primary disconnects further simplify maintenance.

"Long-life" construction . . . All breaker elements are secured to a rigid, all-welded steel frame. Hardened, stainless steel is used at major wearing points . . . silver-tungsten arcing contacts have high resistance to arc burning.

Perfect alignment for interchangeability . . . The use of a master breaker and a master stationary structure in manufacturing holds drawout units and stationary structures to close dimensional tolerances. Result is perfect alignment . . . easy interchangeability.

Proved operation . . . The DH Air Circuit Breaker design has been extensively tested in the Westinghouse High Power Laboratory. The results of these tests are verified by many years of satisfactory field performance on thousands of breakers.

For complete information on Westinghouse Metal-Clad Switchgear write for Booklet B-5306. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60795



A DH Air Circuit Breaker is brought into a test cell in the Westinghouse High Power Laboratory to verify new design feature under short-circuit conditions.

See "Electrical Proving Ground"

. . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details see your Westinghouse representative, or write: Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania.

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METAL-CLAD SWITCHGEAR

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TIME IS THE MEASURE OF ALL THINGS. FEW OF MAN'S INVENTIONS CAN STAND ITS MERCILESS JUDGEMENT. YET KERITE FOR OVER 90 YEARS HAS THRIVED AND SPREAD AND GAINED THE CONFIDENCE OF THE USERS. TIME, INDEED, GIVES KERITE ITS UNQUALIFIED RECOMMENDATION.
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Solving Atomic Power Problems - I

Research, development and power supply in the field of atomic energy have been holding the spotlight in utility circles in recent weeks. Paralleling these activities have been internal discussions regarding the best way for the utility industry as a whole to participate in various phases of this important field.

Even while heated arguments were being carried on, tangible results were reached on many important issues. The tangible results include the signing of contracts by the Atomic Energy Commission with the Ohio Valley Electric Corp for 1.8 million kw of power and with Electric Energy Inc and TVA for an additional 940,000 kw for Paducah, Ky. Following this the Detroit Edison-Dow Chemical Co group signed a new contract with AEC including ten additional companies as associates.

Electric utilities and AEC believe that these are highly constructive moves. Certainly the agreement by 11 utilities to carry on further research in the field of atomic power is most constructive. Their program is intended ultimately to explore the possibilities of a privately owned and operated atomic power plant. Of course this will depend upon the satisfactory solution of technical problems still ahead.

We also have the proposal of a Commonwealth Edison-Public Service of Northern Illinois nuclear study team. Their suggested program would encompass the construction of an atomic power plant, after technical problems are licked. It also proposes a government subsidy covering the reactor and the cost of nuclear fuel in excess of normal fuel.

Still to be solved are the problems of further utility industry cooperation and desirable changes in the atomic energy act.

Philip Sporn, chairman of Edison Electric Institute Committee on Atomic Energy, recently said, "I feel it is important that measures be devised to bring the entire electric utility industry into closer contact with what is going on in this field. I believe that this objective is desirable from the standpoint of the utility systems of the country, both the privately owned and the publicly owned."

As AEC Chairman Gordon Dean has pointed out, the government must relinquish at least part of its monopoly if the peaceful uses of atomic energy are to be brought to full flower.

The electric industry must now work toward more industry cooperation and desirable changes in the law governing use of atomic energy. Only with these problems solved can the results of research and development be fully applied for productive purposes.

Lighting Homes for Christmas

No electric utility will ever declare an extra dividend—supposing the regulatory body would allow it—on the additional revenue from homes lighted up for Christmas. No extra dividend in money, that is. But any utility can earn an extra dividend in public good will by helping and encouraging its customers to spread the warmth of the Christmas spirit abroad in the winter night. Whether it is just a string of lamps hung on a tree in the yard or a display like that in the picture, light says to the passerby, "Here is a home where Christmas is," and all who pass are the better for knowing it.

Don't Miss This Opportunity

There's an opportunity awaiting every power supplier in the land. It is packaged in the Electric Power Kit being offered them by the School Service Department of Westinghouse Electric Corp (EW, Sept. 29, p 46).

This kit is intended as a tool which can be used by grade and junior high school teachers to teach electricity, its manufacture, and its importance to modern living. Leading educators advised on its design and content; so it is educationally acceptable. What is more it has "kid" appeal.

As a tool for developing community relations, the kit has great value. It gives the power supplier an opportunity to make friends with school authorities, teachers, and pupils. It is the last named group that is most important. Tomorrow they are going to be your customers. You can make friends of them today for a trifling amount of cash and not too many hours of time.

Give Service for a Profit

"We're in business to make a profit". So reads the texts of many training courses. We take no exceptions to that statement, for it is a fundamental requirement for successful private enterprise. And yet it leaves in our minds a serious question—a premonition that it fails to accomplish a desirable effect upon the attitude of the trainees.

Let us consider for a moment the basic nature of the electrical industry. Isn't it the aim of appliance manufacturers and distributors to provide their customers with the equipment to see better, or to live better? And isn't it the aim of the equipment manufacturers and the electric utilities to provide better and more reliable electric service to power these devices? In our thinking, the one thing which our industry offers is Service.

This service is rendered throughout the length and breadth of our vast country. And what makes it function? The personal efforts of thousands of individuals and small groups of individuals who design and build lines, operate and maintain generating stations, read meters and collect bills, sell and demonstrate appliances, locate and repair trouble, and perform the varied other special duties of this great industry.

The very nature of their work makes these employees the most important point of contact between the companies and their customers. They must be charged with that esprit de corps which applies their proven skills to render a service pre-eminently satisfying to the customers. Does it improve that service to preach "We're in business to make a profit"? We submit that it might be better for our industry to say, "We're in business to provide a service." The quality and spirit of that service provides a basis for expecting a fair return on the stockholders' investment.

Needed—A New Standard Transmission Voltage

With indications that integration of systems may be accelerated there should be a new focus on transmission voltages. The concern should not be so much about the transition from 66 to 115 kv and 115 to 230 kv. Those uppings will come naturally and without too much deliberation. Attention should be focused on the step above the 230 kv range.

One decision has already been made for 330-350 kv. There has been talk of 380 (like Sweden's) and even 400 kv with 315 and 375 at times brought into the discussions. Justifications can possibly be established on local grounds for each figure. But integration patterns transcend the solely local influences and acquire a semi-national aspect as soon as interconnections between integrated areas are considered.

Approach becomes wholly national when the factor of standardized production enters the analysis. Need there be all over again a whole gamut of transmission voltages above 300 kv to which to design transformers, circuit breakers, towers, and protective devices just as there were when 165, 180, 185, 198 kv, etc were chosen until 230 kv became the ruling level?

Heads should get together to resolve the relatively small differences and accept a common value. The economic advantages of local preferences should prove insignificant if the manufacturers will lay their cards on the table and state the offsetting differentials in favor of a single voltage. They could also contribute by discussing the impact of the established basic impulse level. It would be surprising if the benefits of a standardized value did not exceed those associated with adherence to local choices.

No Profit—Only Reasonable Return

"If the government builds dams and powerhouses and the utility companies have access to the power for distribution to their customers, these companies can make no profit whatsoever on the government's investment. They can earn only the 'just and reasonable return' on their own investment needed to deliver the government energy from the power plant to the customer."

Quoted from speech by E. H. Dixon, Pres, Middle South Utilities Corp.

THE ELECTRICAL WEEK

The Issue's News Highlights—Despite best government efforts to solve the steel problem, utilities can still expect to have trouble getting as much as they need, says Depa Administrator James F. Fairman.

Puget Sound P&L stockholders are reported to have voted in favor of selling the company's properties to six Washington State PUD's. But a court order stands in the way of their consummating the deal.

National Farm Electrification Conference may be in its death throes. A steering committee will decide.

Off the Washington Wire—Electric power mobilizers are downhearted again about outlook of metal allotments for boiler and turbine manufacture. A few of the well informed now wonder if the capacity to be installed next year will be much higher than the 7.2 million kw which is to be put in this year.

Supreme Court has agreed to decide whether federal or state regulation applies to a California electric utility which serves a Navy installation and one county in Nevada. The high court will also hear a complaint from Arizona asking for a decision on division of Colorado River water between Arizona and California.

Bureau of Reclamation claims that it has beat power company rates by 46% in serving an irrigation district in the Tracy, Calif., area.

Hearings are set for Nov. 7 before SEC on an amended plan for dissolution of Pennsylvania G&E, a Wilmington, Del., holding company . . . SEC has ruled Birmingham Electric Power must merge with Alabama Power to eliminate "complexities" in Southern Co system.

FPC has issued a one-year preliminary permit to Blue Ridge Electric Membership Corp for a hydro project in Ashe and Alleghany counties, N. C.

On the Political Front—Last week in Minnesota, President Truman came back to a favorite theme by charging that in event of a GOP victory "electric power millionaires" expect to get control of transmission lines carrying power from government dams and of remaining good power sites on country's rivers. He accused spokesmen for utilities of starting a propaganda drive to get public dams turned over to private companies.

International Joint Commission at its Montreal meeting last week approved the applications of the U. S. and Canadian governments to build the power works in the St. Lawrence River. Only the naming of a U. S. entity is necessary before construction can begin. Canada already has named the Ontario Hydro-Electric Commission to do the job on its side of the river. For the U. S. portion of the power project, FPC has before it an application for a construction license from New York State Power Authority. Now that IJC has approved the power works, the FPC is expected to give favorable consideration to the New York State application.

Labor—Michigan's Gov G. Mennen Williams has named fact finding board (L. W. Walsh, Grand Rapids attorney, F. F. Fauri, dean of school of social work, University of Michigan, and Probate Judge W. P. Wright, Paw Paw) to review labor dispute between Michigan G&E and District 50, UMW.

Proposed 10% salary increase which Tacoma, Wash., City Council proposed for J. Frank Ward, City Light superintendent, was cut in half after protests that "high brass" should receive no more than the 5% increases given other city employees. After this 5% increase, his salary will be $15,120 a year.

As Electrical World goes to press, Detroit Edison's strike continues. Workers walked off their jobs on Oct. 23 while UWUA-CIO members were still attending mediation talks (EW, Oct. 20, p 89).

Rates—Cambridge Electric Light has put into effect Oct. 23 a $164,280 a year rate increase. This is on top of $401,000 imposed Aug. 8 on approval of Massachusetts DPU. Company has appealed to State Supreme Court to approve the $164,280 increase, but this will be refunded if the court sustains the commission. Company had requested a $565,280 rate hike in its petition to DPU.

From New England—United Illuminating is equipping groundmen with yellow fiberglass hats to protect them against falling objects. Hats are also available for troublemen and foremen.

From East North Central—Ohio Second District Court of Appeals at Columbus has ruled that municipally owned electric plants, golf courses, airports, and waterworks are exempt from taxation because they are "public properties used exclusively for a public purpose."

From West South Central—Ponca City, Okla., citizens have voted 1,559-to-185 in favor of $550,000 bond issue to purchase a new diesel engine for its power plant.

B. L. England, President of EEI, has appointed Philip Sporn, president of American G&E, chairman of a committee to consider the broad question of the development and utilization of atomic energy by the electric utility industry and for further cooperation between members of that industry and the Atomic Energy Commission.

Congratulations—Philadelphia Electric has elected Robert P. Liversidge vice president in charge of electric operations . . . Consumers Power has named Carl E. Arvidson vice president in charge of electric production and transmission, succeeding LeRoy L. Benedict retired . . . Anaconda Copper Mining Co. has elected Richard S. Newlin vice president in charge of mining operations . . . Electric Controller & Manufacturing Co has elected A. G. Patterson president succeeding R. G. Widdows who becomes board chairman.

Obituary—Donald Gunn, 50, vice president of Pennsylvania W&P, died in Baltimore on Oct. 22.

Fairman on Power Goals:

"As to progress and prospects, in 1951 about 7 million kw of capacity went into service, a record high. A year ago the 1952 program called for 9 million kw; now it looks like 7 million. A year ago the 1953 program called for 11 million kw; now it looks like no more than 10 million. In other words during 1952 and 1953 17 million instead of the 20 million kw expected will be installed.

"It is hoped that in 1954 the 12 million kw planned a year ago may still be installed. Even then installed capacity will still be 3 million kw behind the original goal. The new goal calls for another 12 million kw in 1955 to cover anticipated load growth and restore reasonable margins between capabilities and loads."

Why Utilities Still Have Steel Troubles

JAMES F. FAIRMAN, Administrator, Defense Electric Power Administration

When the steel strike started last June, the electric utility industry was fast recovering from setbacks caused in 1951 by inadequate allotments of CMP materials. The Defense Electric Power Administration, along with other defense supporting claimant agencies, immediately urged that the strike be considered a moratorium equally applicable to all programs.

Depa believed that this treatment would make possible an orderly resumption of deliveries following the strike. Gradual adjustments could be made in succeeding quarterly material allocations to effect needed changes of emphasis as between programs.

Priority for Defense . . . But the military and atomic energy people couldn't wait. They had a plausible argument, and it prevailed. Now only these two great users of steel can expect to obtain all the steel they need until supply and demand come closer into balance. Other users will just have to get along with the customary advance allotments granted months ago.

When the strike started, steel users had already received their CMP allotments for the second and third quarters. Steel mill schedules were almost complete for the entire period. In addition, manufacturers and builders had been given advance allotments for the fourth quarter and the first quarter of next year. These were expressed as percentages of their third quarter allotments, generally 80% for the fourth and 60% for the first quarter.

When the strike ended, it was found that the steel allotted by this CMP paper was greater than the amount that could be produced in the four quarters begining April 1, 1952.

Revision Difficult . . . Ideally it would have been desirable to revise all metals allotments in the face of reduced supplies, giving more metal to essential programs and cutting further into others. But so complicated are the steel mill schedules that this would have done more harm than good.

So it was decided to let stand all orders on the mills and to direct them to fill the orders as fast as they could. It was hoped that as the result of the usual attrition, enough of the backlog of orders would have disappeared by the end of the first quarter 1953 to allow a broad revision in future allotments.

Actually this decision makes sense. Very little of the steel that goes into civilian goods is vital to the defense supporting programs. For example, the power program needs heavy structural shapes and plate, thick wall alloy tubing, heavy forgings, and large castings. It competes for these with other defense supporting industries, the military, and the atomic energy program.

Unfortunately since Korea there has been little or no increase in the

fabricating capacity for such items and apparently none in prospect. But there has been a great increase in facilities for turning out sheet and strip which go mainly into civilian products.

Discouraging Outlook . . . The outlook for an overall statistical balance in steel supply by the end of the first quarter of 1953 is discouraging enough, based as it is on reduced allotments in the fourth quarter and the first quarter of next year. But the picture on the kind of shapes vital to the power program is even less encouraging.

For example, first quarter orders for heavy steel plate will not be cleaned up until well into May. First quarter tickets for heavy structural shapes will not produce completed deliveries before the end of June. Deliveries of equipment, therefore, will be delayed about the same length of time. This means a setback in the previously scheduled in-service dates of many projects in 1953 and 1954.

This setback due to the steel strike follows two others due to other causes. The inadequate 1951 material allotments cut possible 1952 equipment deliveries. In the meantime requirements for power have been increased by approval of an expanded atomic energy program. These three setbacks to the power program have thrown an increasingly heavy burden upon Depa and the utilities.

It would simplify Depa's job tremendously if all power projects could be allowed to slip uniformly. But that course would increase the hazard of power shortages in critical areas.

Prompt Action Needed . . . It is clear that the situation calls for prompt action on the part of Depa and informed cooperation by the utilities and the manufacturers. It calls for extra effort by all parties concerned in power supply planning and in the scheduling of delivery of major equipment. It calls also for expediting to overcome delays caused by bottleneck situations.

Under these circumstances the job of providing for increased loads in the face of delays in in-service dates of new capacity will be difficult enough at best. It is further complicated by the fact that predicted margins of generating capacity over estimated loads are lower in some areas of the country than in others. Such lower margins in most cases are being caused by a heavy influx of defense plants. Moreover, the regions where the margins are smallest are generally those where additional large defense loads are most likely to develop.

As a guide to the operations of the government agencies, manufacturers, and utilities involved, Depa has established relative urgency ratings for all capacity scheduled for operation up to the end of 1954. These ratings indicate the relative degree of protection against slippage which individual generating projects should receive. The higher ratings have been given plants in areas of lower prospective margins. The very highest have been assigned in those low margin areas where vital defense industries are being located.

Two Factors . . . Furthermore, Depa is responsible for determining the sequence in which power equipment should be delivered to carry the expected loads. Here two factors must be considered:

1. Power plants are essentially custom made. A unit designed for one location seldom can be diverted to another.

2. Because the power expansion goal calls for capacity operation by equipment makers, any delay or idle time in their shops must be avoided. Advancing the delivery of an essential unit may delay others. The total loss may exceed the gain.

So the problem is one demanding the closest coordination between power requirements and factory production of equipment.

To date Depa's rescheduling primarily has affected units intended for service in 1954 and 1955. The addition of large amounts of new capacity for the AEC in these years has been a further factor in this substantial rescheduling. Hence the planning and scheduling functions of Depa will presumably be necessary for some time after controls over basic materials are relaxed.

Loans Were for Co-Ops, Not SPA, Wickard Says

Claude Wickard, head of the Rural Electrification Administration, last week told a U. S. District Court in Washington, D. C. that five disputed loans made to generating and transmission cooperatives were made mainly for the service of the co-ops and not for Southeastern Power Administration, as had been charged.

Wickard was one of several government witnesses who took the stand as testimony continued in the "Missouri Case." (EW, Oct. 27, p 10). Ten Missouri electric companies have charged REA and SPA exceeded the limits of laws under which they operate in negotiating contracts with five "G&T" co-ops. It appeared testimony might go into a fourth week.

A Plant Is Dedicated In Georgia

People bowed their heads in prayer at the dedication of Georgia Power Co's Plant Yates. The 300,000-kw generating station, located near Newman, Ga., was named in honor of Eugene A. Yates, chairman of board of Southern Co. Yates' grandson, Reese A. Shephard, unveiled the bronze plaque set in a stone monument in front of the plant.

Puget Vote Favors PUD's

- **Stockholders reportedly want to accept 6-district offer**
- **Washington Water Power still wants to buy**
- **The battle has moved into the courts**

A large majority of votes cast last week at a stockholders' meeting in Boston favored sale of Puget Sound Power & Light Co properties to six Washington State public utility districts.

This was learned by Electrical World from sources outside the company, since the Puget management had been restrained by a court order from executing the purchase agreement or announcing the result of the vote.

Washington Water Power Co has submitted another offer to buy the company (EW, Oct. 20, p 90; Oct. 27, p. 42). To forestall immediate action on the offer of the six PUD's, two Puget stockholders, John S. Tilney, West Orange, N. J., and William J. Collins, Portland, Ore., asked a Massachusetts Superior Court to prohibit the meeting itself. The court allowed the meeting and the vote but issued the restraining order on actions of the company. On application of the company counsel, the order was modified to permit the officers to announce the result of the vote at the meeting, from which the general public and the press were barred from attending.

To Fight Order . . . Puget is expected to ask the court to cancel the restraining order in toto, so that steps could be taken to carry out the decision of the stockholders.

Criticism expressed by a union official of the proposed sale to six PUD's drew a quick rejoinder from the company.

Speaking at a quarterly conference of the Washington State Association of Electrical Workers in Seattle, J. Scott Milne of Washington, D. C., international secretary of the International Brotherhood of Electrical Workers, A. F. of L., attacked the sale as "one of the stinkingist deals I ever heard of."

He asserted "the officers of Puget Sound have gotten together and protected their interests but have given no consideration to the future of employees of the company when the properties are sold."

Salaries to Continue . . . Milne pointed out that Frank McLaughlin, Puget president, would receive $60,000 a year through 1954 and $30,000 in 1955, even should the sale be concluded. L. E. Karrer, executive vice president, would receive $34,000 annually through 1953. J. H. Clawson, treasurer, would receive $28,500 annually through 1953 and $20,000 in 1954.

The Seattle law firm of Holman, Mickelwait, Marion, Prince & Black was to receive $150,000 at the close of the deal, in addition to retainer fees, Milne declared.

Milne also charged that the company has failed to protect its employees in the sale. Although the company has agreed to set aside $2,250,000 to care for its employees already retired, employees retiring in the future would have no guarantee they would get their pensions, he said.

Karrer replied that Massachusetts law requires the company to be kept alive for three years after a sale. McLaughlin previously had estimated that two years would be required to liquidate the company, after the sale to the PUD's, since distribution properties valued at $15 million still would remain to be disposed of in Whatcom County, as well as the Diamond Ice & Cold Storage Co in Seattle.

McLaughlin, Karrer and Clawson are the only employees the PUD's are not obligated to employ.

As to the other charge, Karrer pointed out that the purchase contract gives Puget employees the right to coverage under the state pension program.

88.1% of Farms in U. S. Electrified, Report Shows

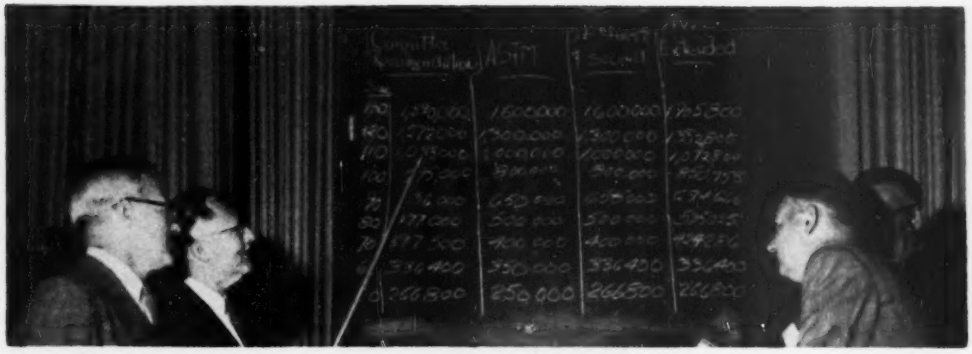
Electrified farms in the United States now constitute 88.1% of the total number, the Department of Agriculture announced this month. A year ago the percentage stood at 84.2%.

The federal agency reported that during the fiscal year ended June 30, 1952, 211,229 farms were wired for electricity.

The figures, compiled by the Rural Electrification Administration, show that on June 30 there were 4,740,849 farms connected to power lines and 641,285 still unelectrified.

Mayor Wields Torch to Open Show

Mayor Vincent Impellitteri uses a torch to burn through a ribbon at ceremonies marking the official opening of the National Electric Industries Show held recently in New York City. With him are (l to r) Jose Ramon Guizado, vice president of Panama; Dominick Paduano, New York City Commissioner of Water Supply, Gas, and Electric Power; and Miss Eleanor Charles of Rochester, N. Y., queen of the show.



FOUR PROPOSALS for standard sizes of all-aluminum wire, up for approval before EEI's Transmission and Distribution Committee are discussed among (left to right) Bryce Brady, Oklahoma Gas & Electric; Fred Nimmer, Ohio Edison; George Ewald, Public Service Electric & Gas; and Edward T. Coupal, Niagara Mohawk. All are members (or alternates) of the subcommittee on aluminum conductor sizes

Conductor standards were discussed by EEI Transmission and Distribution Committee but . . .

Use of Aluminum Still Poses Problems

Edison Electric Institute's Transmission and Distribution Committee adjourned its three-day meeting in Dallas, Oct. 23-25, only a little closer to solving problems of how to use aluminum as a distribution conductor. Design of joints and fittings remain controversial with small progress toward solution.

However, compression connections are clearly gaining popularity. Attempts of the committee to agree on a list of nine standard sizes for aluminum wire remains snagged on the issue of "even circular mil sizes" vs "copper-equivalent sizes" with a small group holding out for sizes based on the AWG progression. Balloting is imminent.

Survey Results . . . A survey of 33 companies reported by C. E. Baugh, Pacific Gas & Electric Co, showed little consistency regarding failure or deterioration of copper-aluminum connection. However, of seven companies with coastal exposure, six reported failures and deterioration. Twenty-one of 33 companies are apprehensive of the use of aluminum in all applications. But only six companies were sufficiently apprehensive to inspect service connections as requested by Chairman Baugh of the Subcommittee on Aluminum Conductor Fittings.

H. W. Biskeborn, Kaiser Aluminum & Chemical Corp, reported that European utilities have been successfully using bi-metal fittings for 25 years that employ an insulating washer to separate copper and aluminum. He questioned why the principle hasn't been used in this country.

Irving Matthysse, Burndy Engineering Co, rejected such European connectors as large, awkward, expensive, and not adaptable to American practice. J. A. Pulsford, Public Service Electric & Gas Co and Baugh said conductor and fittings manufacturers share responsibilities for development of suitable connection methods. In this respect "maybe utilities have not done their share," Baugh said. He charged power company engineers with neglecting to give manufacturers needed information on which to base development. Concensus of the subcommittee was that the problem of developing suitable connections lay outside their capabilities.

Better Tools . . . R. W. Sherwood, Gulf States Utilities Co, although believing the compression sleeve is "here to stay" called for better hydraulic tools, particularly for use on energized circuits. Present tools are not suitable, he said. Needed are a coding system to match sleeves and proper dies and standardized dimensions of compression sleeves.

Objections arose to a subcommittee recommendation that standard aluminum conductor sizes be based on copper equivalency. It was challenged by those who saw little benefit in "copper equivalency". They recommended a "rounding off" of sizes. A still smaller group argued for an extension of AWG progression. The latter felt it confusing to have circ mil sizes of both all-aluminum and ACSR concide. E. B. Shaw, Philadelphia Electric Co, proposed adoption of the closest even circ mil sizes to those recommended adding only the popular 266,800 and 336,400 circ mil sizes.

W. C. Nimmer, Ohio Edison Co, said the committee membership will again be polled on the various alternative suggestions.

Close Rating . . . So closely rated was one "packaged" 5-hp air conditioning unit that its motor exceeds nameplate current at rated voltage, said B. M. Gallaher, Texas Electric Service Co. A 1.15% voltage unbalance increased the high phase current as much as 16% increase in balanced voltage. Greater unbalances showed marked effect upon the current. Half of his air conditioning voltage complaints involved less than 3% unbalance.

Reporting on a voltage survey of eight utilities, J. W. Anderson, Philadelphia Electric, stated that 90% of

(*Continued on page* 182)

Sell . . . and Sell . . . and Sell

BENJAMIN GROSS, President, Gross Distributors, Inc., New York

We Must Boost Our Selling Tempo

Selling capacity must keep pace with production capacity. Looking ahead, the distributor must improve his operations, and put his knowledge of market to work

"When the tempo of defense activity slows down, private enterprise, not government, must carry the burden of keeping our amazing production capacity at work. It would be unwise to wait for defense expenditures to taper off before planning for the post defense period."

This advice, quoted from a recent speech by Charles Sawyer, Secretary of Commerce, is of real moment to the electrical industry. He said also, **"Industry must work as hard to develop distribution techniques as it has worked in the past on production techniques."** It is the purpose of this article to point up the application of Sawyer's words to an important segment of our industry, the distribution of electrical appliances. Key figure in the picture is the distributor himself. His responsibility is the principal concern in this discussion; but since he stands between the manufacturer and the retailer, successful discharge of his obligation depends on their recognition of their responsibilities.

To be prepared for the task that the future expansion of consumer goods production will bring, each distributor organization, from top to bottom, must broaden its vision, must enlarge the scope of its perceptions. By personal development executive and non-sales personnel must make themselves more efficient, more alert to opportunities for improvements in all aspects of operations.

All sales personnel should now be given special training in sales technique. They should learn how to absorb knowledge and how to teach others. They should be schooled in the maintenance of records and other data whereby to gain know-how for better control of their activities and those of their dealers. They should study self direction for more effective relationship with their trade and for more efficient employment of their time. They should urge wider and more useful applications of manufacturers' materials in sales aids, advertising, sales and servicing advice. They should increase their knowledge of credits, collections, finance plans, retail salesmen's compensation, store arrangements and displays—all the many factors that make for dealer improvement.

It is timely for the distributor to examine the degree of coordination within his manpower structure for maximum inter-departmental efficiency between sales, credit, collections, service, shipping, purchasing, inventory controls, and executive management. Reconstitution of present methods and practices now will yield immediate returns in economy and will prepare the way for orderly expansion.

Market research using the data available from many governmental sources, trade and management publications, and local newspapers, coupled with a good system of records and statistics, provides excellent backing for a progressive manpower. Knowing where a business has been, where it stands, and where it wishes to go pays high dividends. This type of activity is especially valuable in any expansion program. Contrary to general opinion, a distributor's market research department is not a frill but an

extremely valuable asset to general management and to the sales division. In tomorrow's broadened market it is a must.

The plan of organization for the distributor sales department is trending heavily towards product grouping to provide a greater degree of concentration. Some distributing operations have as many as four or more separate sales staffs, each headed by a product manager reporting to the general sales manager. These specialized groups ordinarily function in this manner in larger cities only. In the more sparsely covered areas with fewer dealers and smaller potentials, members of the sales field staff each handle more of the lines and in many instances all of them.

Each plan must be determined based on the nature of the territory covered as to potential, available dealers, character of lines involved, and policy of operations. Research covering the many methods employed should be broadly conducted to provide the factual information as to controls, supervision, costs and pertinent experiences on which future plans can be erected.

Controls to assure balanced inventories present an extremely difficult task. First consideration should be given to convincing dealers of the necessity for them to carry adequate stocks for proper display and prompt delivery. If they will not or cannot, severe inventory burdens are imposed on distributors. Maintenance of a fair apportionment of inventories at all levels, manufacturer, distributor, and dealer, is essential for assurance of orderly movement of merchandise in the days of high production to come.

The responsibility of the distributor for maintenance of replacement parts, both for in-warranty and out-of-warranty products, is of primary importance to dealers and consumers. Unfortunately provision for the high costs of supporting this activity is not adequately made in the pricing structure, by manufacturers or distributors, in view of the degree to which dealers have ceased to carry out their proper servicing responsibilities. This condition must be corrected before the flood of expanded production comes upon us as it can severely retard public buying.

Building up the retailer to regard consumer satisfaction as the first order of good business and the true source of success through the medium of repeat business is a distributor responsibility of top magnitude. Given the proper support by his manufacturers, the distributor is sure to act in protection of their common best interests.

To assist as well as guide and advise his dealers in their financial operations is a prime responsibility of the distributor. In this regard there has developed a most serious fault in credit extension and control by distributors generally, and by factory branches as the worst offenders. The amount of open account credit to dealers far in excess in proportion to their invested and working capital has created a most dangerous financial hazard. Any extension of the present era of unprofitable retail operations could bring about a long series of troublesome failures. A tremendous number of instances exist nationally where dealer indebtedness is several times net worth and working capital, with creditor "ownership" of net assets exceeding the dealer's equity in his business by several times.

Saner Credit Policy

This unhealthy and untenable condition was brought about during the extremely high turnover period coupled with close dealer margins and insignificant real net profits. Of course uncontrolled price cutting created and fostered by the many malpractices of the industry aided in eliminating profits and making for most unethical competition. Undue concessions, price discrimination through direct and so-called "associate distributor" commitments, advertising deals with fraudulent rates and rebates, all played their part in undermining an otherwise sound business. A safer and saner credit policy must be adopted soon. This responsibility of the distributor to himself and to the trade must be acted upon now to assure a healthy thriving dealership. Otherwise, there will be only a weak foundation on which to build the greater selling structure needed in the future.

Early in this article it was stated that successful discharge of the distributor's responsibility depends on recognition by the dealer and the manufacturer of their obligations. The trade aspect of this interdependence has been covered in the foregoing paragraphs. Since the manufacturer fixes the product—its design, appearance, performance, cost and quality—and also its production volume, the heavier obligation is on him. **It is unfortunate, but true, that much too often the manufacturer refuses to accept useful ideas concerning products available to him through the distributor.**

The distributing industry is in a peculiarly favorable position to view, understand, and interpret, based on the most intimate relationship and experience with consumer, producer and merchant, what the merchandising requirements of a product are. These requirements are set forth in some detail in the accompanying panels. As indicated by the "Three M's" of one panel, **creation of the product has become as much, or more, the child of the merchandising**

The Three M's of Consumer Goods Distribution

MERCHANDISING = MERCHANDISE + MARKETING

is the modern	to be properly	to be successful calls for
TECHNIQUE	MARKETABLE	A—The Right PRODUCT
of	must be created	B—In the Right PLACE
consumer	through the	C—In the Right QUANTITY
product	BUYER'S EYES	D—At the Right TIME
BUSINESS	not merely the	E—At the Right PRICE
STRATEGY	MAKER'S VIEWS	F—In the Right LIGHT

(This chart is adapted from the book, "A Merchandising Primer," by Herbert E. Wilson, soon to be published by McGraw-Hill Book Co.)

The Merchandising Bill of Rights

A—The Right Product:

1. Utility—application to need
2. Performance—fulfillment of need, services rendered
3. Convenience—ease of usage
4. Styling, eye appeal, finish
5. Materials, durability, ease of maintenance
6. Capacity, size, weight, dimensions
7. Features, plus features
8. Product differences between models and competitively
9. Variety and assortment, range of units within a line, sectional or geographic area models
10. Unique—adaptability—new usage
11. Competitive advantages
12. Marketing advantages
13. Intrinsic and utilitarian advantages
14. Identification
15. Warranties
16. *Development and progress of the art*

B—The Right Place:

1. Distribution Policies:
   a. branches
   b. distributors
   c. direct to dealers
   d. direct to consumers
   e. combination
2. Retail Exposure:
   a. general
   b. broad
   c. selective
   d. exclusive
   e. specialty
   f. mixed
   g. types of outlets
3. Markets, relative attention to:
   a. major cities
   b. urban areas
   c. suburban
   d. rural
4. Coverage by:
   a. direct employed field men
   b. general field representatives

C—The Right Quantity:

1. Market Absorption Scope:
   a. existing fields
   b. degree of saturation
   c. penetration possibilities
   d. expansion possibilities
   e. virgin markets
   f. replacement markets
   g. point of sale capacity
   h. distributor facilities
   i. *fair share of industry*
2. Production capacity:
3. Relative balance between models and items as to:
   a. calibre of buyers
   b. price ranges
4. Controls for production schedule changes with market fluctuation and seasonal loads
5. Quotes and goals

D—The Right Price:

1. Inherent value judged impulsively
2. Intrinsic value judged by utility factors
3. Comparative value judged in relation to:
   a. kindred products
   b. competitive products
4. Price levels for sale in class and in mass markets, broadly and geographically
5. So-called "natural" price brackets
6. Terms
7. *Margin provisions for distributors and retailers to provide adequate profit incentive for sales effort*

E—The Right Time:

1. Nature of product—seasonal, all time, functional—climatically or geographically or as to utility
2. Schedules for product announcements, presentations, sampling, booking, sequence of shipments by models, stocking, clearing
3. *Controls for model changes, additions, and deletions*
4. Controls for price changes for stimulation of sales or coverage of cost increases

F—The Right Light:

1. The appeal in basic principle
2. The name, labeling
3. Sales policies re franchises, price controls, and coordination with the "Right Place" elements
4. Packaging
5. Literature; instruction, operating, and service manuals
6. Displays
7. Sales Aids
8. Training programs for distribution channels and at point of sale
9. Advertising as to national, key city local, cooperative, and choice of media
10. Presentations to own staffs, distributors, dealers, public, press and institutions
11. Promotion programs
12. *Appropriations to cover all items from No. 5 through No. 11 with due consideration for proper apportionment to each based on relative position of vital importance to the established processes of marketing and the end results desired*
13. Policies as to:
    a. administration in distribution channels of co-operative and local key city advertising funds
    b. method of supplying all the various sales aids and providing for their effective and efficient usage
    c. activities to assure effectiveness of national and other advertising at the point of sale
    d. demonstration processes
14. Market research covering effectiveness of methods
15. Statistics for benefit of trade, reflecting area results
16. Finance plans, wholesale and retail

activity as of the manufacturing conditions. Consumer products must meet the exacting ideas and needs of the purchasing public—present and future—if the greatly increased volume in the years ahead is to be successfully marketed.

The remarkable ingenuity of manufacturers in the utilization of new ingredients and materials, their vast inventive capacity, and particularly their resourcefulness in developing high speed production facilities have already taxed the distributing structure of the country. A bulge in production of even small proportions has repeatedly led to distress within the selling structure mainly because the merchandising essentials have not been substantially recognized and preparatory steps not been taken for due development of absorption capacity in proportion to production facility growth. In the coming phase of necessary expansion of consumer goods absorption, "merchandising" of a broader character is a must so that distribution can sustain fully its

share of responsibility for expanded sales.

In the future creation of merchandise, industry must be willing to scrap a considerable portion of its existing designs, tools, and dies. Producers will have to bring forth completely new products, new in adaptability to daily personal habits and creative of new modes of living.

Examples—all too few however—exist of unique development of products which have wrought great changes and amazing activation of particular segments of the consumer goods business—for instance, the advent of automatic clothes washers, and now the home clothes dryer, the canister type of vacuum cleaner, the electric home broiler, the home freezer and of course, television. These new products have not only changed and stimulated better living habits, but they also created entirely new needs and demands. Furthermore, by greatly increasing the desirability and utility of product, the dollar unit has been raised, and the overall volume of business in each field has grown.

Merchandise Mismarketed

Many lines of consumer products have been miscreated and mismarketed by many a leading manufacturer. The lack of proper, adequate, and intensive research, planning, and investigation has been most costly to all levels from manufacturer to retailer, and the public too. Often this has occurred through the lack of understanding of the interresponsibilities existing between the producer and his channels of distribution.

Many practices of manufacturers, distributors and retailers have been based on short-sighted, opportunistic, and severely self-serving policies. Much destruction has been wrought bringing the entire industry as such into ill respect in the public mind. When publications like Fortune (June 1952), find occasion to publish a severely critical detailed story of the malpractices prevalent in the appliance business and that material is broadly supported by similar articles, both before and after, appearing in many trade, business, and consumer publications, it is high time for drastic correction. Unless many of the malpractices indulged in are eliminated, great difficulty will be experienced in building the required structure capable of fulfilling the task of ready absorption of the greatly increased production ahead in this industry.

A glaring example of sterile thinking is apparent in the promotion of last year's models at cut prices, by certain refrigerator manufacturers, during their main season. Some manufacturers actually went back into production of these models. A fine replacement business could be created with some real new developments, new usages, and new services in the modern refrigerator, but the malpractice of instigating cut price promotions destroys the full effectiveness of such constructive efforts.

Regardless of the will to place responsibility in due proportion on each level, there is little question but that the prime obligation in respect of initiating the control of malpractices is the manufacturer's. The producer determines not only the product but also the policies of movement of his merchandise to the consumer. He determines quantities, production schedules, pricing, distribution methods and the degree to which he shall interest himself in the marketing practices and their control.

Instead of generalizing regarding harmful practices, the time is here to be specific. Thereby some of the ills might be corrected at least by those in the industry who, in the expectancy of favorably influencing the others, choose to assure for themselves a better course.

The first most natural issue is the question of industry overproduction. Too many manufacturers aim to corral too high a percentage of the whole, adding up in aggregate goals sometimes to 200% or more of the realistic market potential. The pressure this creates on the trade is reflected in their approach to the public, maintaining an aura of distress and urgency even in good season. While individual manufacturers benefit from their own initiative, they would still prosper to a like degree, and most likely even better, from a sounder observance of true industry-wide market possibilities. The method of determining quotas and area volume goals would then take into account not only the usual factors provided by statistical sources but the degree of existing penetration, the nature of virgin and replacement markets, and many other factors pertinent to each such area.

A rapidly growing problem putting severe strains on the distributing structure is the degree to which many "independent" manufacturers are bringing out product items crossing into product fields other than their own specialty. For example, a television manufacturer entering the air conditioning and then the electric range business, a range manufacturer engaging in dryers and air conditioners; a refrigerator manufacturer adding home laundry equipment. The upset to their lines amongst "independent" distributors, reflecting difficulties for those manufacturers, promises to be most troublesome.

Whether this broadening of product lines by manufacturers is in their own best interest is a vital question. It is well nigh impossible for any manufacturer to excel or even equal the best in every product field simultaneously. Thus products of secondary merchandising value are carried along and sold by force. Such diversification is of course natural with any manufacturer who looks to broadened opportunities and believes he cannot grow in the field of his chosen specialty. Does not this impression flow to some degree from lack of ingenuity and sufficient research in the creation of entirely new developments within his existing scope of product? Isn't the choice for spreading created by a certain loss of confidence that healthy growth isn't possible otherwise?

Of course the urge to expand, to develop greater bigness, to compete with other larger operations is logical in our industrial system. The questions are: How broadly will this spreading go? Will it soon take place with so many manufacturers that a new approach to distribution, at least at the wholesale level, will have to be found? Will it eventually mean higher costs of distribution rather than an economy because of less concentrated and effective efforts?

Can the appliance industry as a vital segment of the great consumer goods business of our country shoulder its responsibility in the vast expansion era ahead while it rests on a foundation unsound in many important aspects? Is it not for distributors as the ones carrying so many of the dual responsibilities outlined to help bring into being the correctives essential to the future welfare of the appliance industry? Will manufacturers take a deepseated interest in these matters and apply the correctives their responsibilities call for, and do so in time to preserve the future? Will this happen spontaneously or will the industry wait until others have captured our proper heritage and our just share of the great opportunities ahead?

The Commodity Method of Forecasting Peak Loads

DPA Commodity Goals[1] Translated into Energy Required by Industry

Selected Defense Production Authority Expansion Program Goals

	1950	1951	1952	1953	1954	1955
Primary Aluminum – Thousand Tons	719					1744
Chlorine – Thousand Tons	2200					3430
Calcium Carbide – Thousand Tons		780			1230	
Hydrogen Peroxide – Million Pounds		23.1				45.4
Magnesium – Thousand Tons[2]	120			131.5		
Nitrogen – Thousand Tons	1639					2930
High Purity Oxygen – Billions of Cubic Feet		21800				36600
Paper & Board – Thousand Tons		40655				46346
Phosphate Rock (P_2O_5 inc.) – Thousand Tons[3]		3500			5000	
Elementary Phosphorous – Thousand Tons		161				275
Plastics – Billions Pounds	2.1					4.6
Steel Ingot – Thousand Tons[3]	99.4				123	

Notes:

1. Includes studies which have not been publicly announced but have reached a stage which permits translation into energy requirements.
2. Plant capacity.
3. Gross Tons

Industrial Energy Requirements — Billions of Kwhr

	1952	1953	1954	1955
Chemicals	41.1	44.7	48.4	50.8
Iron and Steel	42.6	44.8	46.8	46.8
Non-Ferrous Metals	30.8	39.1	47.2	52.1
Rubber Products	4.8	4.8	4.8	4.8
Paper & Allied Products	27.2	28.0	28.7	29.7
Textile Mill Products	11.7	12.0	12.2	13.0
Food Processing	13.1	13.7	14.3	15.0
Stone Clay and Glass	11.0	11.0	11.3	11.5
Transportation Equipment	10.2	14.5	18.9	19.0
Petroleum & Coal Products	8.5	9.0	9.6	10.0
Machinery & Electrical Machinery	15.8	18.0	20.0	19.0
Lumber	3.8	4.1	4.4	4.4
All Other Manufacturing	12.0	13.0	14.0	15.0
Total Manufacturing	232.6	258.7	280.6	291.1
Extraction	13.0	13.8	14.3	15.0
Oil and Gas Line Pumping	6.0	6.8	7.6	7.6
Irrigation Pumping	4.5	5.4	6.0	6.0
Total Industrial Requirements	256.1	284.7	308.5	319.7

Source: C. R. Beardsley, Defense Electric Power Administration

Depa Studies Defense Production

Lack of power will become the chief bottleneck of the nation's defense buildup unless power supply is kept in proportion with established commodity goals, C. R. Beardsley, chief of Power Requirements Branch, Defense Electric Power Administration, said last week.

Beardsley addressed a district meeting of American Institute of Electrical Engineers at Toledo, Oct. 29. In a recent Depa study, based on this commodity method of forecasting, he said, a peak load of 77.0 million kw was forecast for 1952.

Forecasting of power requirements must, he said, depend upon specific commodity requirements added to the usual civilian requirements in home, farm and commerce. In forecasting peak loads established commodity goals must first be translated into energy requirements. To these are added all other requirements. Losses in transmission and distribution are added to obtain required generation at the source.

In this study no allowance was made for station auxiliaries, therefore the totals represent net generation including generation in manufacturing plants.

The Method . . . Late in 1950, Depa began to accumulate data on the power needs of key commodity producers and their proposed expansion, particularly those whose use of electric power is heavy. These included producers of steel, aluminum, ferro alloys, abrasives, calcium carbide, chlorine, elemental phosphorous, and others.

While this general program was being developed, it was necessary to forecast the need for power capacity in order to be ready to serve the new manufacturing plant Beardsley pointed out.

The Morehouse Committee attacked the problem by first analyzing the utilities' method of estimating loads. Energy requirements based on Depa commodity studies later served as an independent check.

When the commodity energy requirements and other civilian uses were totalled, and annual load factors applied, the resulting peak loads confirmed utility estimates.

The energy requirements shown here are gross figures based on the following assumptions:

- That established commodity goals will be attained.
- The effect of possible strikes or other stoppages is ignored.
- That no significant change in economic status will occur.
- That full mobilization will not take place.
- That government appropriations will be adequate.
- That little change in labor supply and hours of work will occur.

Dependable electric power capacity to carry this gross load must be provided if goals are to be met. Capability must be adequate in the face of possible hydro shortage or other emergency.

Recession Considered . . . Beardsley pointed out that the timing and degree of the moderate recession predicted for 1953 is not certain. This because:

- The backlog of manufacturing orders is increasing.
- The present appropriations for defense have not been fully committed

PLUS Other Energy Requirements Translates Into Peak Loads

Energy Requirements of Home, Farm & Commerce — Billions of Kwhr

	1952	1953	1954	1955
Government & Public Authorities	10.2	26.8	43.1	52.5
Street Lights, Railroads, etc.	11.4	11.5	11.5	11.5
Commercial and Small Power	64.5	72.7	82.0	95.0
Residential and Rural	93.2	104.0	113.0	130.0
Total Other Requirements	**179.3**	**215.0**	**249.6**	**289.0**

Total Energy Requirements — Billions of Kwhr

Requirements of Industry	256.1	284.7	308.5	319.7
Requirements of Home, Farm, and Commerce	179.3	215.0	249.6	289.0
Losses and Unaccounted For	52.3	60.0	65.9	73.0
Gross Requirements at Source	**487.7**	**559.7**	**624.0**	**681.7**

Notes:

Munitions production is scattered through manufacturing classifications.

These are gross energy requirements of all production and use goals.

Sources of Energy — Billions of Kwhr

	1952	1953	1954	1955
Generation by Utilities	413.3	480.7	540.6	590.8
Generation by Manufacturers	72.0	76.6	81.0	88.5
Net Imports	2.4	2.4	2.4	2.4
Total Sources of Supply	**487.7**	**559.7**	**624.0**	**681.7**

Peak Loads — Millions of Kw

Generation by Utilities	413.3	480.7	540.6	590.8
Annual Load Factor (%)	61.4	63.3	63.6	64.0
Peak Load	77.0	87.0	97.2	105.5

Notes:

No allowances are made for strikes, changed economic conditions, shortages of materials, alterations of established programs, adverse hydro, curtailments of power, etc.

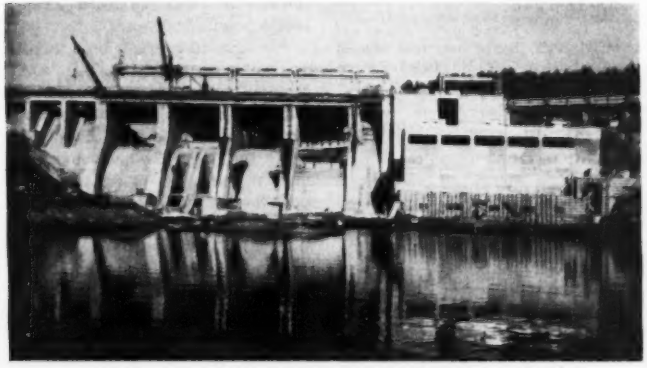
For 1952, both the total energy and load factor will have been lowered by strikes and curtailments but with only slight effect on December peak.

Goals to Predict Peak Load

and more will be appropriated.

- Deliveries of munitions are only recently reaching speed.
- The demand for housing is unsatisfied.
- Commercial and other construction has been deferred.
- Employment and income will continue at high levels.
- Only half of the necessary manufacturing expansion has been attained to date.

It appears probable therefore that the peak of activity will not be reached in 1953; that it may not be at as high a level as originally expected; that the slippage will tend to fill in the slight recession expected by many; and a rising demand for more electric power will continue into 1955 and well into 1956.



Power from Canadian Fish Stream

The Tobique Narrows Project on the Tobique River near Perth, New Brunswick, is expected to start producing power for New Brunswick Electric Power Commission in Canada early next year. At that time the first of two 12,500-kva units will go on the line. The Tobique is one of the province's most important salmon fishing streams. A fishway is being constructed to facilitate migration.

Power Expansion Plan Is Studied in Nicaragua

MANAGUA, NICARAGUA (McGraw-Hill World News)—Financial experts are studying recommendations made last month to triple the present capacity of the government-owned power production facilities here in Managua. The proposals also include the installation of a power network to connect with other important cities here.

The recommendations are part of a five-year development program, involving investment of between $60-76 million, made by experts from the International Bank for Reconstruction and Development.

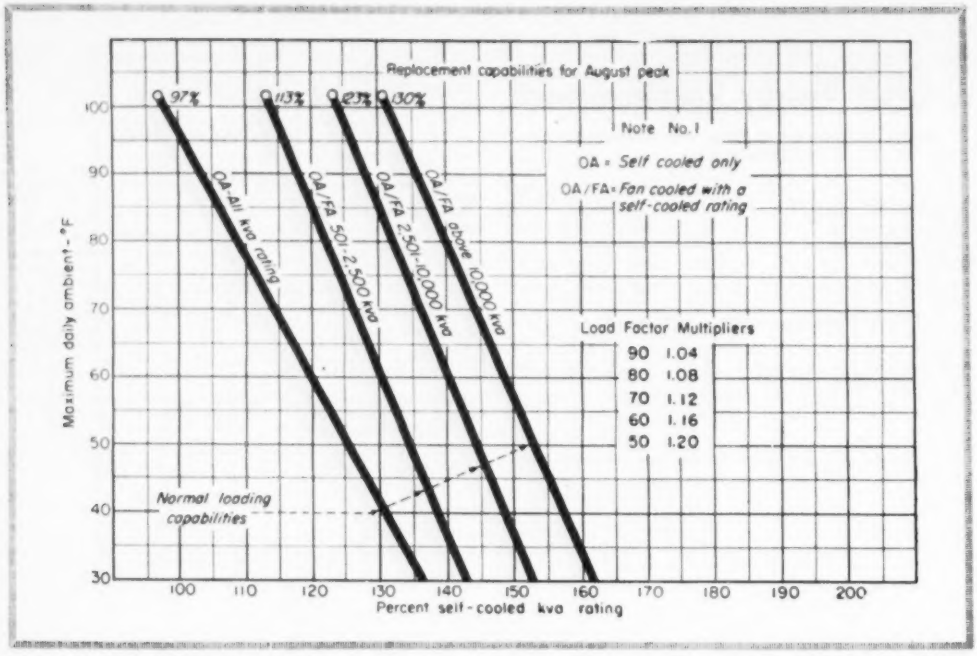


FIG 1—LOADING CAPABILITIES can be determined by using load factor multipliers, shown, with values for 100% load factor as determined from curves for four types of substation transformers. Maximum daily ambient assumed daily average plus 12F

How to Load Transformers by Depa

Plan will keep loss of insulation life within 1½% for planned emergency loading and 6% for absolute emergency loading. Based on ASA Standard C57-32-1948

L. M. LIMPUS, Transformer and Regulator Specialist, Oklahoma Gas & Electric Co, Oklahoma City

The economic importance of loading power transformers above their name plate ratings is now backed up by the Defense Electric Power Administrator's Industry Letter No. 40. Presented here are charts showing how the ASA Guides may be readily applied to determine the values permitted in the Depa letter.

Fig 1 shows the normal percentages of self-cooled kva rating for all reasonably expected ambient temperature. The four usually encountered classes of substation power transformers are included. These are self-cooled, fan-cooled at 115% of self-cooled rating; 125% and 133% tank sizes. The kva ranges shown on the curves may be used as bank ratings, either as single-phase or three-phase units.

The maximum daily ambient scale is of especial interest. It is the type of data that is readily available to the average transformer operator.

Fix Ambient Scale . . . Location of the ambient scale relative to the curves is a simple operation for any locality. It was fixed for the State of Oklahoma as follows. The average daily maximum temperature is about 12F higher than the daily average. This is particularly true during the summer months when most of the peak loads are experienced. It therefore reflects the daily average. This data is readily obtained from any local weather bureau. Transformers are generally designed to carry 100% load, continuously, in an average 30C ambient. Changing 30 C to Deg F and adding 12 degrees for the maximum over average gradient, we get 96.8 F. The 100% load, self-cooled, is thus located at this point.

The other curves have been located in relation to the self-cooled "OA" curve in accordance with the ASA recommendations. This inter-relationship will not change with locality, and only a shifting of the maximum daily ambient scale, to correspond with local conditions is required.

Fig 1 is constructed for a 100% load factor, and appropriate load factor multipliers are shown.

Curve A (Fig 3) shows the maximum permissible top-oil temperature for the percent of load determined from the data in Fig 1. This oil temperature is to be used in connection with modern transformers. An oil temperature of 10 degrees less should be used for the older, weaker units, and in some cases even a reduction of 15 degrees might not be unreasonable.

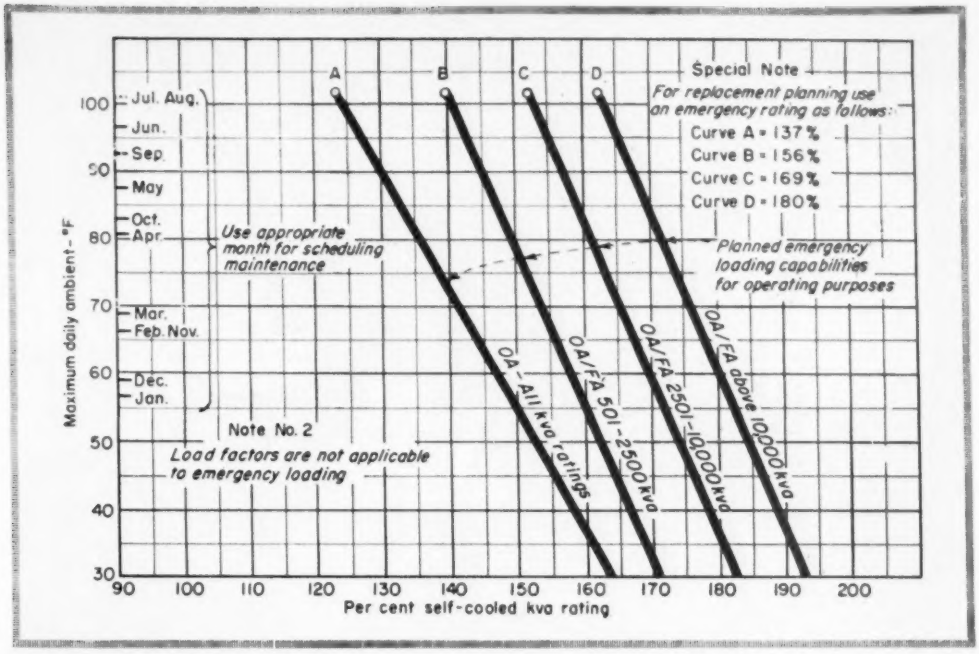


FIG 2—PLANNED EMERGENCY CAPABILITIES of four groups of substation transformers, as shown by curves, can be converted to absolute emergency (DEPA) capabilities with multiplying factor of 1.11. Adapted from ASA C57-32-1948

Regulation

Emergency Capabilities . . . Fig 2 shows the emergency capabilities of the same four groups of transformers. The actual curves show what we call "Planned Emergency Capabilities." These capabilities differ from the Depa letter's capabilities only in that they reflect an ultimate top-oil temperature of 90 C instead of the recommended 100 C, as stated in the letter. Planned emergencies are those operations involving replacements and maintenance work. Absolute Emergency (Depa) Capabilities are determined by using a multiplying factor of 1.11.

Fig 2's ambient scale has been modified to include months as well as degrees. The various months were located by using the Depa letter's monthly averages, to which were added the Oklahoma average daily maximum to daily average gradient. This scale is used effectively in planning replacement and maintenance operations. Emergency loadings are estimated and checked against the appropriate months for performance.

As most of our peak loads occur in August, the percentage values are marked on the curves of each figure. These are the actual values we use in determining data to be submitted to Depa and in predicting when replacements must be made. By using Fig 2 we expect to correct all emergency loading conditions within an elapsed period of 24 continuous hours. If the correction cannot be made within this time, then the loading values are too high and cannot be used.

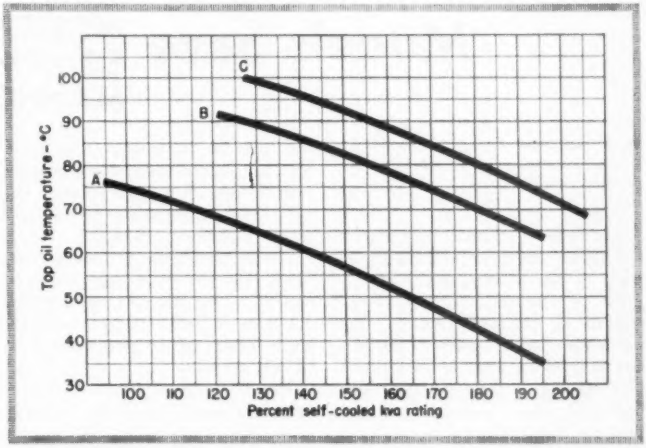


FIG 3—MAXIMUM PERMISSIBLE top-oil temperatures for normal loading (Curve A— based on data from Fig 1), for planned emergency loading and for absolute emergency (DEPA) loading (Curves B & C—based on data from Fig 2)

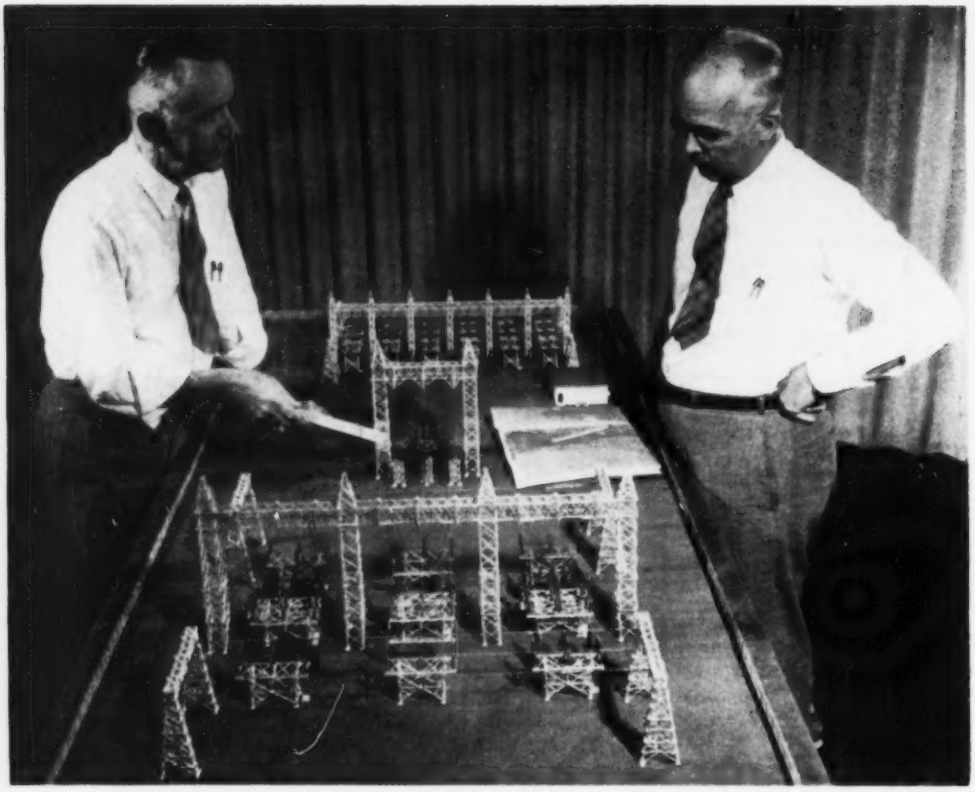


FIG 1—220 KV SUBSTATION MODEL in foreground built to scale of ¼ in. to 1 ft was instrumental in simplifying transformer dead-end structure and establishing clearances in substations now building at Sunbury and Hazensack. In background is separate model of associated 66-kv structure built ⅛ in. to 1 ft. When models are no longer needed, components can be used again

Models Save TIME MONEY EQUIPMENT MANHOURS in Utility

W. B. MORTON, Station Electrical Engineer, Pennsylvania Power & Light Co., Allentown, Pa.

The use of accurate scale models has greatly improved engineering designs of the Pennsylvania Power & Light Co's utility structures. Design replicas of generating stations, unit substations, large power substations, and distribution pole-top installations have revealed in three dimensions the best and safest operational designs. Both electrical and physical clearances and working spaces show up plainly in the models.

Tangible and intangible gains more than pay for the models. Every one used has yielded design changes as its construction progressed under the supervision of design and safety engineers and operating personnel.

Design alterations in models save much in construction time and cost and allow improvements which would not be made once the field installation began because of the great expense of full-size revision.

The model of the Sunbury Steam Electric Station* (Fig 5) not only improved design and safety, but assisted in the training of operators before the plant was ready. Total cost for the model was $21,000 and 5,500 manhours over one year. Its main structural members are made of brass, other parts of wood. Floors and roof are transparent plastic. Outside walls are aluminum and removable for viewing the interior. Built in three sections it is mounted on tables for easy viewing either as a whole or divided into sections to make interiors more accessible.

The dollar saving of the Sunbury model is recognized as many times its actual cost. A typical example is the lighting system. The illuminating engineers were able to lay out the light-

* Model Helps Design of Sunbury Station, Power, Feb. 1949

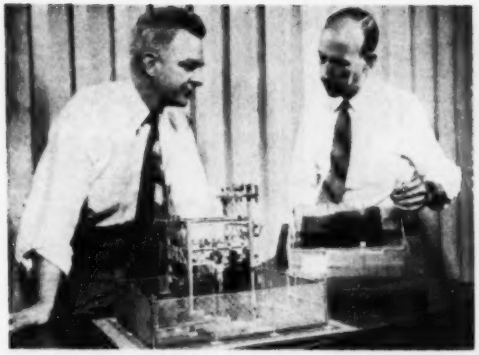


FIG 2—12/4-KV DISTRIBUTION SUBSTATIONS of the unit type (right) and the field-erected open type (left) are duplicated to scale of ½ in. to 1 ft. Among other uses these models have proved effective in discussions before municipal zoning boards. Models often lead to use of fewer structural units

FIG 3—TRANSFORMER BANK (left) and pole-top reclosing circuit breaker installation (right) were built to scale of 3 in. to 1 ft in the course of establishing company distribution standards involving safe working space and clearance

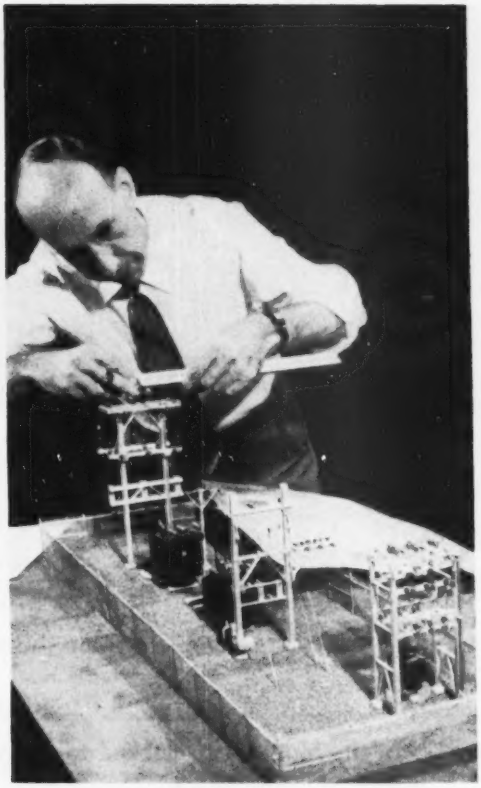


FIG 4—STANDARD 66/12-KV SUBSTATION built to scale of ¼ in. to 1 ft represents one of the predominant types used on the system. Construction of this particular model disclosed inadequate clearance to hot lead lines not readily apparent in drawings

Design and Construction

ing and see dark areas from actual interference shadows produced on the model. This would have been impossible using two dimensional drawings.

To train operators, lectures were given before the station went into service, using the model as the basic means of illustration. The model also helped the operators place the plant in operation. In addition, it has been used in technical lectures and in demonstrations to the public, producing many intangible benefits.

The model shown in Fig 1 represents the standard Type E 220 66-kv substation, consisting of two sections —a 220-kv and a 66-kv switchyard— arranged so that they may be used separately or together as a combined station. At a cost of less than $2,000, it was constructed almost entirely of wood, and is a faithful scale reproduction. This model, when partly completed, indicated that changes in the arrangement of transformers could be made at a saving of about $10,000. Other changes were made as the model progressed, but this one item more than paid the initial cost. Another substantial saving was made during an early phase of the model's construction when close clearances discovered in the vicinity of the breaker were rectified on the drawings before foundations were poured.

Models have been built of 12/4-kv distribution substations both of the open and of the totally enclosed, factory-built, unit type (Fig 2). These are invaluable in discussions of site locations in built-up areas when selection must be made between open construction and the more expensive, totally enclosed, factory-built unit.

Model use has not been confined to stations and substations but has been equally successful in distribution research work. The study model shown on the left in Fig 3 was constructed as a guide to aid designers in eliminating unsafe congestion in older designs,

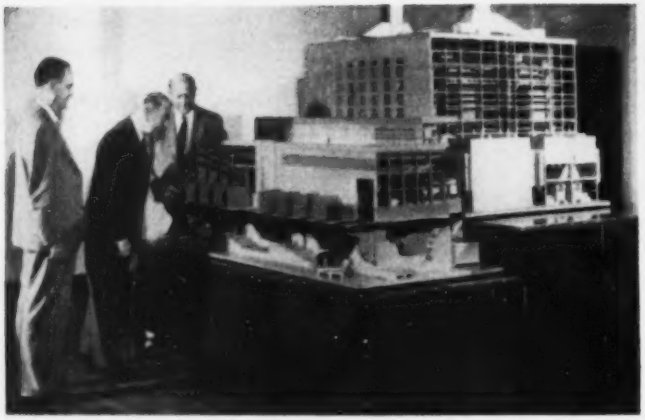
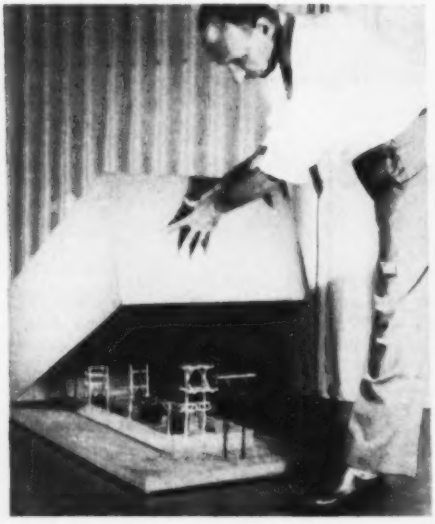


FIG 5—COMPLETE MODEL of Sunbury Station is mounted on table with casters. Hinged sections swing out to reveal various plant cross sections. Turbine room is moved aside for examination of boiler room. Individual items are also removable (electrical and mechanical precipitators—right) for examination of equipment behind them

improving arrangement of transformers with better clearances, and reducing construction cost and operating expense. The study model on the right in Fig 3 produced a pole-top, oil circuit breaker installation with a greater safety factor, better appearance, and appreciably lower cost than previous designs.

Pennsylvania P&L is now constructing a permanent model shop which will be equipped and manned for the construction of models for engineering use and for the advertising department's public relations work.

How the Models Are Packed for Shipment



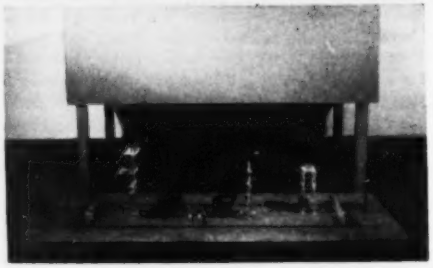


FIG 6—SHIPPED TO SITE of construction for use by contractors and engineers, the packing case of the model, with its hinged legs (above right) serves as rolling table for model display (below)

Farm Electric Group in Limbo

Fate of National Farm Electrification Conference in hands of group that will decide if it is to remain operative.

National Farm Electrification Conference will not meet in 1953. That was decided by the conference steering committee at NFEC's seventh annual meeting in Detroit last month.

To replace the general session, the committee, composed of representatives of the 26 national trade associations, professional societies and others interested in farm electrification, will meet to determine the future of the conference at a time and place to be announced later.

During the discussion preceding the decision, emphasis was placed on the need for an organization in which the diverse interests involved in farm electrification could be integrated into the overall national picture. It was an awareness that NFEC, as presently constituted, was not accomplishing this that brought about the committee's action. At least three possibilities remain open, conference officials believe:

- The general meeting method may be reinstituted under a new set of principles.
- The steering committee may meet on at least an annual basis.
- NFEC may be scrapped altogether.

Difference of Opinion . . . If it never has another meeting, NFEC could look back on some interesting moments at its seventh one. A share of them were provided by R. E. Johnson, manager, Farm Sales Department, Toledo Edison Co, who charged that farm extension workers were not cooperating with power suppliers in emphasizing the dollar and cents value of electrical equipment to the farmer.

"They have regarded as an unnecessary expense," he said, "installation of equipment that at the same time has built load for the power supplier and improved farm practices and profits for the farmer."

R. T. Jones, farm sales manager for Pennsylvania Power & Light Co called for increased educational work among the farm youth whom he called "the future business leaders of the community."

Although American farm youth is the best informed in the world on rural electrification subjects, he said, past activities have been hampered by: (1) lack of interest; (2) lack of know-how; (3) insufficient personnel; (4) no definite program; (5) lack of appreciation of the value of the work.

Officers Elected . . . New chairman of NFEC is H. E. Slusher, president of the Missouri Farm Bureau Federation. Other officers: John Strohm, associate editor, Country Gentleman, vice chairman; Russell Gingles, manager, Farm Electrification Bureau, secretary; and Karl H. Gorham, business manager, Electricity on the Farm Magazine, treasurer.

Depa Acts to Strengthen Power Conservation in NW

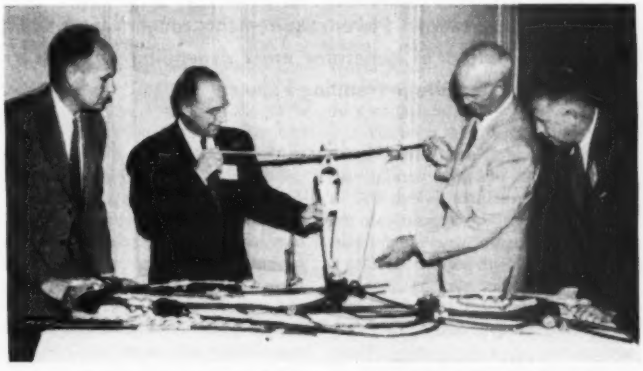
Defense Electric Power Administration moved in last week to strengthen voluntary power conservation measures in the drought-harried Pacific Northwest.

The action is designed to prevent utilities from taking on large new loads previously shed as interruptible loads by other utilities. It may void a 20,000 kw contract already in effect between Public Utility District No. 1 of Cowlitz County, Wash., and Reynolds Metals Co.

Acting under the Defense Production Act of 1950, Depa issued order EO-5 which "prohibits electric power deliveries to large power consumers under new contracts entered into after Sept. 1, 1952." It applies to contracts with consumers using more than 50,000 kwhr per week, which includes most aluminum, magnesium, chemical and paper pulp producers in the area. In hardship cases, utilities may apply to Depa for relief from the order.

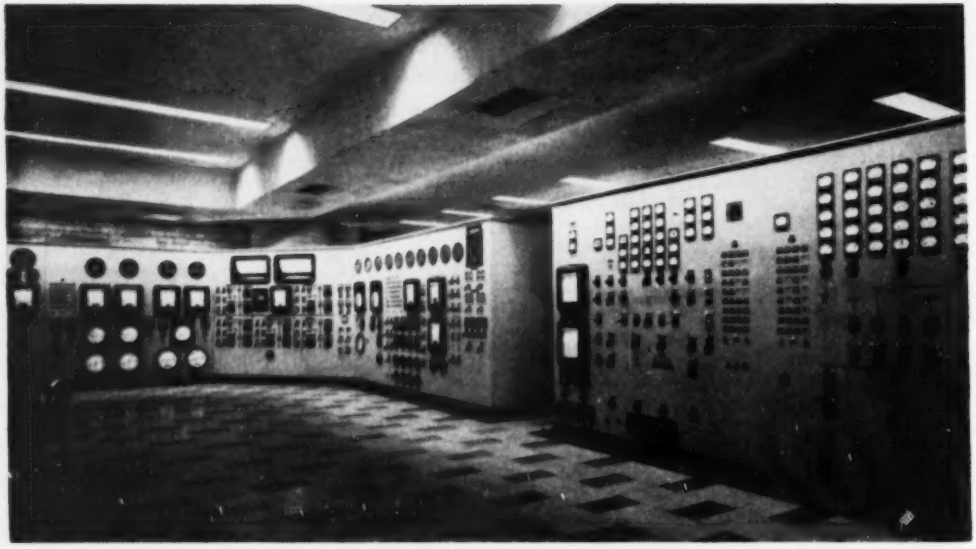
In issuing EO-5, Depa emphasized that this was not the general power limitation order, which has been discussed for weeks in the area. The general order will be issued only when Depa finds it necessary to curtail firm power commitments to larger power users. Most of the interruptible power in the area has already been shut off by utilities acting under the voluntary conservation program.

One effect of the order issued last week may be to put an end to the contract under which the Cowlitz PUD has been serving a part of the load of the Reynolds' Longview, Wash., aluminum plant. This contract has threatened to weaken the whole voluntary program, and Depa was requested to put an end to it.



Aluminum Is at Work in Wisconsin

Utilities are beginning to be less conservative in using aluminum as they gain experience in its use, C. E. Topping, Consumers Power Co, recently told the Technical Division of Wisconsin Utilities Association's Electric Division. The division met along with the Sales Section in Milwaukee, Wis. Topping, second from left, pointed out some features of aluminum connectors and splicers to H. A. Peterson, University of Wisconsin; L. P. Works, Wisconsin Public Service Corp, and N. J. Fischer, chief engineer, Mississippi Valley Public Service Co.



CENTRAL CONTROL ROOM of Philip Sporn Station of American Gas & Electric System

Today's Trends In Steam Plant Design—III

Auxiliary System Loads Are Mounting

Auxiliary supply transformers connected to generator terminals in 75% of newest installations. Separate turbine-generator set seldom used today. Power requirements range from 5 to 8% of kilowatt output of generator units depending on pressure. Auxiliary system voltage trending higher

J. B. **McCLURE** and **A. G. MELLOR,**
General Electric Co, Schenectady, N. Y.

The auxiliary power requirement for a single boiler-turbine-generator unit varies between about 5 and 8% of the kilowatt output depending on the throttle pressure. Some single units now being built will require 15,000 kw of auxiliary power.

Most of this power is consumed by boiler feed pumps, fans, pulverizers, and circulating water pumps. These comprise a relatively few motors of which the boiler feed pump motors are the largest. Because many of the auxiliaries are provided with motors of liberal rating, the auxiliary system generally operates at power factors in the order of 0.7. This must naturally be recognized in the choice of transformer capacity.

According to a recent survey, approximately 75% of the newest installations comprise a unit system and have auxiliary power transformers connected directly to the terminals of the main generator for their normal source of auxiliary power. About 20% obtain power from the generator voltage bus. About 4% draw it from shaft generators directly driven by the main set, and 1% from a separate turbine-generator set.

Shaft generators have been used to isolate the auxiliary power system from voltage disturbances on the main system. Sometimes separate turbine generators have been used to provide isolation from both frequency and voltage disturbances. However on modern systems these disturbances are usually of short duration, and so it has now become more difficult to justify the extra cost of separate auxiliary generators.

Power for starting a unit and for general station service is usually obtained through a transformer from the high voltage system.

For the smaller units, 15,000 kw and below, the entire auxiliary power may be adequately distributed at 460 or 575 v. For units larger than this, however, 2,400 v is preferred with 1/5 to 1/6 of this power being stepped down to 460 or 575 v on a radial basis to supply the smaller motors. For very large generating units the auxiliary power is supplied at 4,160 v.

An accompanying illustration shows a typical one line diagram of a dual-voltage system with split buses and supplying power either to two boilers for a turbine generator or a single large boiler with divided auxiliaries. Experience has confirmed that the reliability of transformers and switchgear is sufficiently high to justify the use of these simplified radial systems without the necessity of providing complicated interconnections with

other unit auxiliary power systems.

For a fault on either auxiliary power bus only half the auxiliaries will be lost, and this permits the unit to continue at almost ⅔ output. In addition, the split bus permits the use of more economical and lower interrupting duty switchgear for higher blocks of total auxiliary power. In employing this principle as an economy measure, care must be taken to maintain approximately 85% voltage on the bus during the starting of the largest boiler feed pump motor or the pump may not come up to speed due to the critical shape of the torque slip curve for large, high speed induction motors.

4,160-v Motors . . . In general, the saving in switchgear by going to 4,160 v is to a large extent offset by the premium paid for such motors. So that the use of 4,160-v systems is confined to the larger generating units. In other cases this higher voltage is adopted earlier at a plant where anticipated unit sizes in future expansions will require such a voltage.

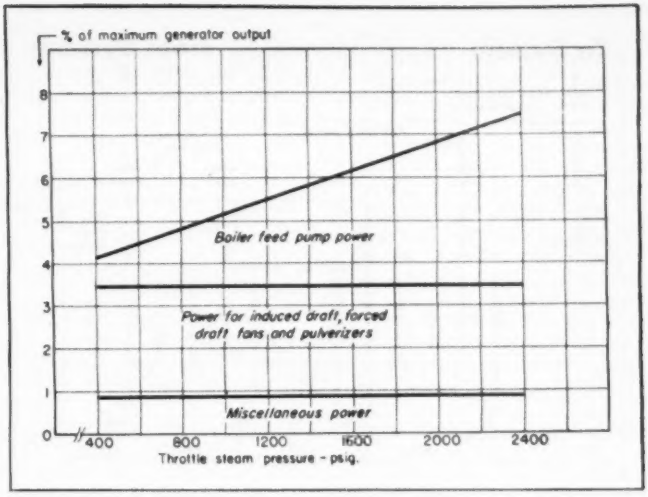
As insulation levels of equipment are lower with respect to the operating voltage at 4,160 v, it becomes less desirable to continue to operate this system isolated with a sustained ground. With the larger units associated with 4,160-v auxiliary systems divided auxiliaries are almost universally used. For these reasons there is an increasing acceptance of grounding these higher voltage systems and clearing faults as rapidly as possible. Grounding can preferably be accomplished through a resistor which will permit 1,000 to 2,000-amp fault current which is adequate for prompt relaying and at the same time reasonably limits the damage at the point of fault.

Starting up . . . In starting up, power is supplied by the starting transformer, and the unit may be brought up to speed and synchronized with the system. Normal and starting sources may now be paralleled, thus avoiding frequent shock to the motors during the normal start-up procedure, and the starting source promptly tripped off to avoid the hazard of excessive interrupting duty on the breakers.

Because the starting transformer is usually connected to the high voltage system it is almost always an outdoor unit. Likewise the premium for other than oil-filled transformers makes it desirable to locate the normal auxiliary transformers outside the station wall but nearby to reduce the low voltage cable runs. These transformers will have taps to compensate for station voltage level and are frequently of the self-cooled type with low velocity fans, which is an easy way of insuring that adequate transformer capacity is available. The 600-v transformers will almost always be indoors and throat-connected to either 600-v air breakers or metal-enclosed contactor groups. They will be of the askerel-filled type or more recently of the air-cooled type.

The 5-kv switchgear should preferably be centrally located with respect to the larger motors. Room is generally available between the turbine and boiler rooms at either the turbine room level or one floor below. The 600-v switchgear and contactor groups can profitably be broken up with their transformers into several units and distributed around the plant near motor groups.

The high reliability of transformers and metal-enclosed switchgear and control has led to the adoption of single bus, radial distribution systems for this type of service. Special factory built units consisting of supply breaker of air break type, induction regulator and group feeder breakers are now available for supplying the plant lighting circuits.



AUXILIARY POWER NEEDS increase as steam pressures increase

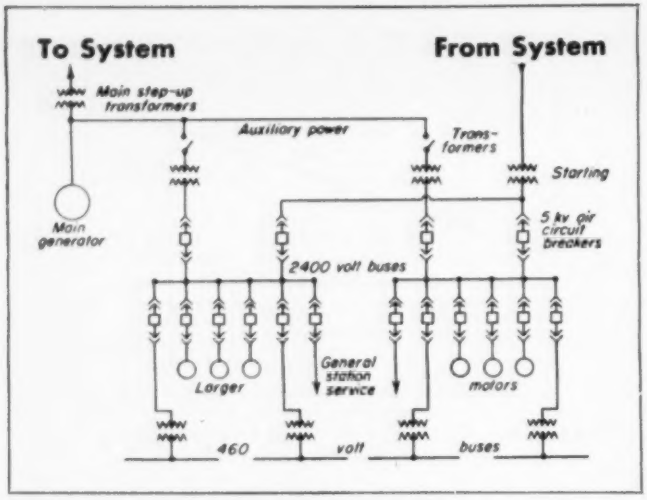
Auxiliary Motors . . . As almost all station auxiliaries are now motor driven, the reliability of a steam generating station is to a large extent dependent on the reliability of the auxiliary motors.

Motors driving essential station auxiliaries usually use sleeve bearings. There is, however, a growing acceptance of anti-friction bearings for other motors.

In general, Class A insulation is used for all motors located in moderate ambient air temperatures, either indoor or outdoor. Some motors, such as those for fan drives, which are located at points in the station where air temperatures are high may require Class B insulation. All motors should be specified for power station service, thus ensuring that the best possible insulation treatment will be applied to them.

In determining the distribution of the auxiliary motors between the high and low voltage buses, a conservative approach will preferably result in motor ratings not less than 200 hp at 2,300 v and 250 hp at 4,160 v. This approach is based on providing sufficient mechanical rigidity in the motor end windings for adequate bracing to withstand repeated full voltage starting. In general, economic design of the auxiliary power system will result in motor distribution having still higher horsepower limits at the respective voltages.

Motor Enclosures . . . Several types of enclosures are available to suit all



TYPICAL AUXILIARY SYSTEM, draws normal auxiliary power from main generator, starting power from external system, does not require separate turbine set

types of applications both indoor or outdoor. Drip-proof and splash-proof motors are only suitable for indoor use. For outdoor use the choice is among totally enclosed fan-cooled, totally enclosed with surface coolers, and modified base-ventilated motors. The first of these outdoor types is available in a complete range of sizes but is much more expensive than other types of motors. Totally enclosed motors with surface coolers are available in sizes above 200 hp, and, of course, require a supply of cooling water. This type is being increasingly accepted as it is considerably less expensive than the totally enclosed, fan-cooled type.

All totally enclosed motors with surface coolers, regardless of size, should be equipped with embedded temperature detectors to guard against a failure of the cooling water supply. To meet the demand for less expensive motors for outdoor use, the modified base-ventilated motor has been designed. Experience to date indicates that this type will give satisfactory service for most outdoor applications. It should be realized, however, that maintenance on this type of motor can be expected to be considerably higher than on the totally enclosed types.

Appropriate Motors . . . The following are some comments on motor applications for some of the larger drives:

1. Boiler feed pumps—When located indoors, most of these drives use drip-proof, 3,600-rpm motors. Pump drives are usually constant speed, but a few use constant speed motors with a hydraulic or magnetic coupling. Pedestal bearings have usually been used on the motors, but there is recently a trend to end shield bearings.

Another recent trend has been the use of totally enclosed motors with surface coolers. The principal reasons for this are the increased cleanliness, reduced noise, and the elimination of objectionable heat release to the room.

2. Fan Drives—In general, drip-proof motors with Class A insulation are used for fan drives. In some cases where motors are exposed to high ambient temperatures, Class B insulation may be specified. Constant speed motors are usually used with magnetic or hydraulic couplings or with vane control. In addition damper control is almost universally used.

Induced draft fans have high inertia, and so particular attention should be given to the thermal ability of the motors on these drives. In some cases, special motor design may be required to meet this condition.

3. Pulverizers—The type of motor used for this application depends on the type of pulverizer used. Crusher type pulverizers require a motor having high starting torque. Hammer mill pulverizers have high inertia and so require a motor with normal torque characteristics but with adequate thermal capacity. Drip-proof motors are usually used for either type of pulverizer.

4. Circulating Water Pumps—Drip-proof motors with normal torque characteristics are used for these pumps. Almost half of these motors are vertical type.

5. Coal Handling Equipment — Motors for driving coal handling equipment are usually exposed to extremely dirty atmospheres. For this reason totally enclosed motors should be used.

Particular attention has been given in recent years to the appearance of motors, and the design of enclosures has been modified to improve on this feature.

Station Protection . . . The protective relaying schemes for a generating station should be designed to minimize damage to equipment under abnormal conditions while at the same time providing for maximum reliability and continuity of service. To meet these two requirements, judgment is required in deciding which conditions should cause the equipment to be removed from service and which conditions should only sound an alarm, leaving further action to the station operator.

The general protective arrangement consists essentially of a group of overlapping, differentially protected zones beginning at the generator neutral and extending from there to include the generator and its outgoing connections, the main step-up transformer, high voltage bus, auxiliary power transformers including their connections, and the main auxiliary power buses.

Generator and Main Transformer Protection . . . In stations built on the unit scheme with the generator directly connected to a step-up transformer, one set of differential relays should cover the generator, and a second set both the generator and transformer. Operation of the differential relays should trip the main generator breaker, the generator field breaker, the turbine stop valve, and the breaker on the secondary of the auxiliary power transformer connected to the generator terminals.

When the generator neutral is grounded through a high impedance such as a distribution transformer with secondary resistor, the differential relays will not detect a ground fault in

the generator. In these cases, an overvoltage relay connected across the secondary resistor can be used for ground fault indication. Although the ground fault current that can flow with this form of generator neutral grounding is quite small, the generator should be tripped immediately to avoid the possibility of a one-line-to-ground fault developing into a phase-to-phase fault.

Back-up Protection . . . As back-up for the generator-transformer differential relaying and also for the system relaying, single-step distance relays with a timer should be used.

For protection against overloads, temperature detectors in the generator stator windings, in the hydrogen stream to and from the coolers, and in the transformer should be used to sound an alarm.

The preferred method of preventing prolonged operation of a condensing-type turbine generator unit at very light loads or motoring is to provide a temperature-sensitive device on the exhaust end of the turbine. This device can be used to sound an alarm and to trip the unit after a specified time delay.

The above generator protective equipment is the bare minimum that should be provided. Optional protective devices such as loss-of-field relays, out-of-step relays, and field ground detection may be found desirable depending on local operating conditions and experience.

Auxiliary Power Transformer Protection . . . An auxiliary transformer directly connected to the generator terminals can be included in the differential relaying zone of the main power transformer and the generator. However, this does not provide very good protection because of the relatively small fault current that may flow in case of a fault in the auxiliary power transformer. More satisfactory protection can be obtained by providing separate differential relaying around the auxiliary power transformer alone. Overcurrent relays should be provided for back-up protection.

The starting transformer should have separate differential protection.

Auxiliary Power System Protection . . . All feeder breakers should have an interrupting rating greater than the available fault current. All feeder breakers and contactors should have instantaneous tripping for short circuit protection.

In order to minimize damage from a bus fault, bus differential relaying should be used. Auxiliary transformer secondary breakers should have time-delay overcurrent protection which will act as back-up for either feeder or bus faults. Where the two auxiliary buses in a split system are connected through a bus tie breaker, it is even more important to have bus differential relaying as in this case the relays for the transformer secondary breakers must have a longer time delay.

All motors should have overload protection provided by either thermal relays or inverse time overcurrent relays.

There is still a difference of opinion as to whether this protection should be allowed to trip the motor circuit or just sound an alarm. An arrangement, which is growing in acceptance, actually does both. The overload relay sounds an alarm on slight overloads, but if the overload indication is accompanied by high current (two to three times normal which would quickly damage the motor), then the overload relay is allowed to trip the motor circuit.

Inverse-time undervoltage protection should be provided on the auxiliary bus to transfer the bus to the starting transformer. These relays should initiate the transfer after reduction of voltage to 70% of normal for a prolonged period or with only a slight time delay if the reduction in voltage is more severe. This transfer obviously should not be made if the bus has lost voltage because of the tripping of a transformer secondary breaker indicating either a bus fault or the failure of a feeder breaker to successfully clear a feeder fault. To prevent damage to motors on re-energization, the emergency throw-over should be delayed until the residual voltage on the auxiliary bus has decayed to about 20% of normal which results in a time delay of approximately one second.

Station Controls . . . In recent years it has become common practice to centralize controls of two or more boiler-turbine-generator units at one location in the station. This development has resulted in fewer operators being required, more efficient operation, and better control of the station, particularly during periods of emergency.

Centralized control rooms should include all controls essential for station operation, but provision should be made for local control of essential equipment in emergencies. For safety reasons high pressure steam lines and hydrogen control panels should be located outside the control room, but essential indications should be transmitted to the main control panels.

In general it is not usually practical to control more than two generating units from one location. In large stations with many outgoing lines and complex high voltage switching, it is often desirable to locate these controls apart from the generator control rooms.

Outdoor Stations . . . During the past few years various types of outdoor stations have been designed and built in many parts of the country. These types range from those merely having part of the boiler outdoors to those having almost everything outdoors except the control room. The desire to put as much equipment as possible outdoors has required modifications in design of equipment, particularly in enclosures.

Turbine generator sets for outdoor use have been provided with a walk-in enclosure over the front end of the turbine to protect the turbine valve gear and other accessories. An enclosure is also provided over the turning gear and another enclosure over the exciter.

For many outdoor applications modified base-ventilated motors are satisfactory. However, in areas subject to severe dust and sand storms either totally enclosed, fan-cooled or totally enclosed, surface-cooled motors should be used.

Auxiliary power switchgear at 2,400 or 4,160 v can be mounted outdoors, but for operating and maintenance reasons this equipment should preferably be located indoors. Part of the cost of the extra building space required will be offset by the saving in cost of indoor switchgear over outdoor switchgear.

It is not considered practical to locate control panels, low voltage switchgear, and excitation cubicles outdoors. This equipment must be kept clean and dry which is practically impossible unless it is inside a building. A building must in any case be provided for the operators, and the extra space needed for this equipment will not appreciably increase the building cost.

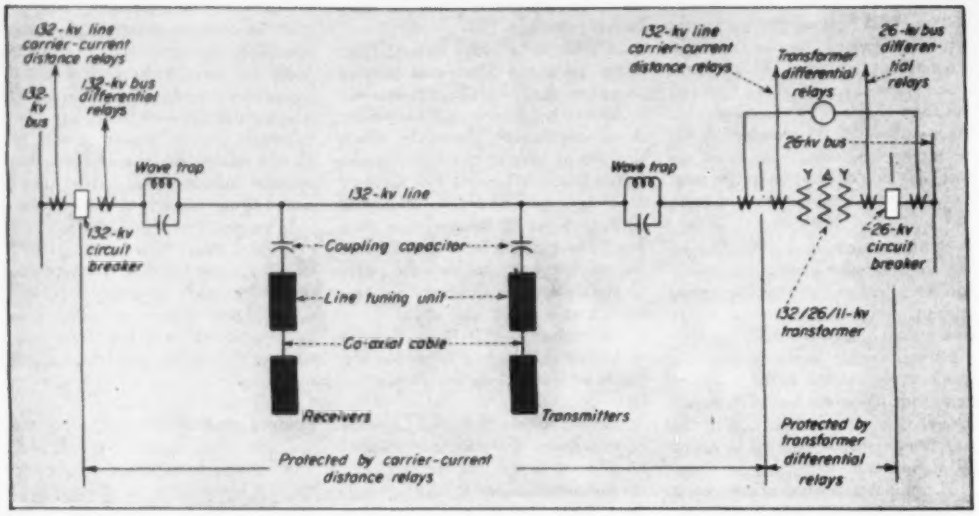


FIG 1—FREQUENCY-SHIFT TYPE of carrier-current system provides a discriminating high-speed tripping signal to remote breaker in event of a transformer fault and permits omission of high-tension breaker at the transformer bank itself

One Circuit Breaker Less . . .

. . . saves Public Service E & G $50,000 on a 12-mile, 132-kv line connecting Kearny Plant with Bergen substation

By using remote-trip, frequency-shift, carrier-current equipment, Public Service Electric & Gas Co eliminated a transformer bank high-side breaker and saved $50,000 in capital investment. Differential relays trip the 26-kv, low-tension breaker when the transformer bank is faulted, and the carrier-current remotely trips the 132-kv high-tension breaker 12 miles away, isolating the bank from the system. The carrier-current system reliability is comparable to that of a high-side transformer bank breaker.

The system relies on crystal-controlled, frequency-shift techniques. It provides high-speed (two cycles) transferred tripping with assurance against undesired tripping because of any combination of power failure, component failure, switching, or other operation factors.

The equipment is designed for operating between 70 and 200 kc. The crystal adapts the set for the 140-kc channel. This narrow-band, frequency-shift system employs the principles of frequency modulation for the transmission of control impulses.

IRVING D. PERRY, Electrical Engineering Dept, Public Service E&G Co, Newark, N. J.

Transmitter . . . A frequency-shift type transmitter as normally operated sends a blocking signal. This discriminating signal prevents extreme carrier-frequency disturbances incorrectly tripping the circuit breakers. The signal is shifted to a lower frequency when remote tripping is desired. The remote tripping equipment is independent of the relaying carrier-current equipment with the exception of the line-tuning units, coupling capacitors, and wave traps.

The transmitter (Fig 2) consists of a crystal oscillator and three long-life tubes. It is normally operated at the higher blocking frequency so that failure of the reactance tube will not cause incorrect operation. When tripping is desired, the bias on the reactance tube is changed, shifting the transmitter frequency approximately 100 cycles lower to the tripping frequency. The transmitter is powered directly from the 130-v station control battery without the use of conversion equipment.

Receiver . . . The receiver consists of two crystal filters, four long-life tubes, and rectifiers. Except for short-circuiting of the grid and plate of the relay amplifier tube, tube failures will not cause incorrect tripping.

The receiver signal is first passed through a crystal bridge filter which has a very narrow band width. The bridge is adjusted so that random noise will "look" like a blocking signal to the receiver. The signal then is passed through an RF amplifier tube and a limiter. This is followed by a second bridge filter which is directly connected to the discriminator. The discriminator is connected to a twin triode relay amplifier tube. The operating element grid of this tube has a fixed bias approximately 25 v beyond cut-off. The normal blocking signal adds an additional bias of approximately 25 v negative. Normal tripping signal output of the discriminator is approximately 32 v positive which, when the 25 v negative fixed bias is subtracted from it, places a 7-v positive bias on the relay tripping tube grid, causing plate current to flow and tripping relay to operate.

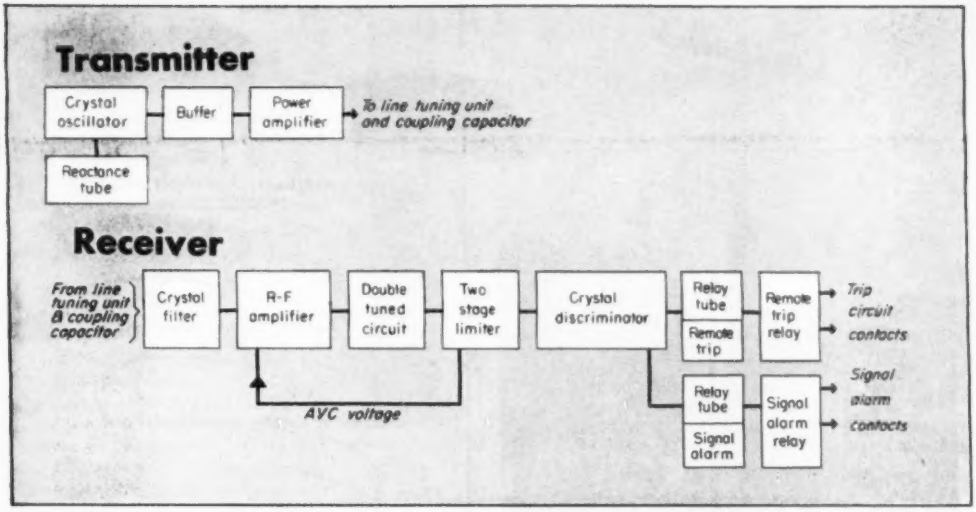


FIG 2—CRYSTAL CONTROL provides an extremely narrow band width which limits the noise energy accepted and permits the desired signal to override random noise and to perform its function. The receiver is powered by batteries to avoid being affected by system outages

Supervisory element of this tube is biased for linear operation. The normally transmitted blocking signal keeps contacts of alarm relay open. When the blocking signal fails, alarm contacts close, lighting annunciator and ringing trouble bell in station. The receiver is powered directly from the 130-v station control battery without the use of conversion equipment.

Remote Tripping . . . To insure correct operation of tripping equipment and to minimize time when remote tripping would be unavailable because of equipment failure, two remote trip channels are used. They are both normally in service. To trip remotely, both circuits must function correctly. The two channels use carrier frequencies approximately 1 kc apart so that only one carrier frequency channel is allocated for the two channels. If one channel fails, it is isolated; and the circuit is operated on the remaining channel until trouble has been eliminated. Use of two channels permits periodic checking of remote tripping equipment without taking the remote tripping equipment out of service. One channel is temporarily taken out of service and checked. It is then returned to service and the other channel checked. The channel in service provides remote tripping continuously.

To insure the correct performance of the equipment, extensive acceptance tests were made. The 132-kv disconnect switches were arced, and the performance was checked for:

1. Normal blocking operation
2. Normal tripping operation
3. Performance of receiver without a blocking signal.

With a fixed bias of 20 v on the operating element grid of the relay amplifier tube, the disconnect switches in the station were arced and showed no reading on a 0-100 micrometer connected in the plate circuit. The receiver was left energized without blocking signal for a period of several months. During this time, an ionosphere storm occurred which caused a reading in the plate circuit. The fixed bias was raised to 25 v. This bias is sufficient to override any interference caused by ionosphere storms.

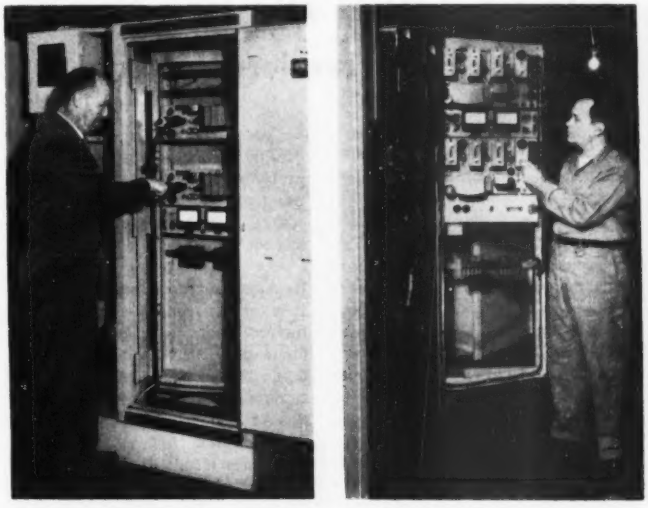
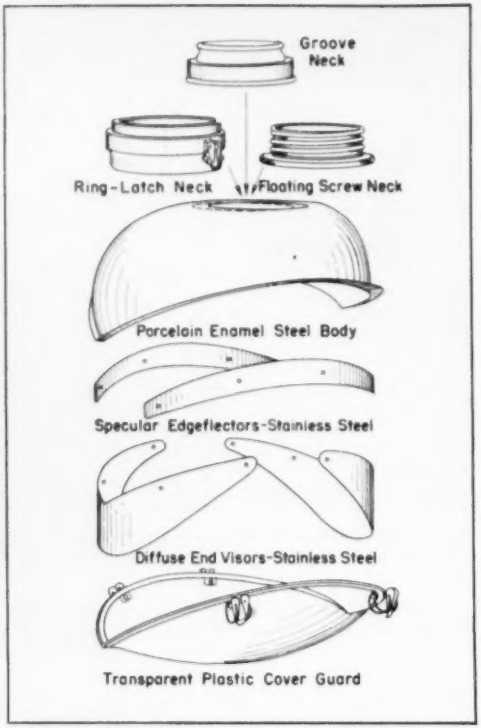


FIG 3—TRANSMITTER at Bergen Switching Station (left) and receiver at Kearny Generating Station (right) are crystal-controlled, frequency-shift, carrier-current equipment. Operation is at 140 kc, power source is 130-v dc station battery needing no convertor

REAL SAFETY LIGHTING, not just "beacon" or "guidance" lighting, is readily attained by use of new helmet-type luminaire



REFLECTOR DESIGN is versatile. Any standard necks can be used. End visors and transparent plastic cover are easily applied

Street Lighting for Pedestrians

Foot Travelers No Longer "Forgotten Men"

W. B. ELMER, Manager Street Lighting Dept., Wheeler Reflector Co., Boston, Mass.

High intensity street lighting is a powerful safeguard against night traffic accidents. No informed person would deny that economic justification is ample to support an almost unlimited expansion of such lighting all through the United States. This justification and the industry-wide activities to this objective have been so intense that the subject has preoccupied the attention of practically all street lighting engineers in recent years. In fact, American Standard Practice has been written almost exclusively around traffic safety. Where pedestrians are mentioned in this practice, however, they are considered in their relation to the existing vehicular traffic. The older problem of lighting the pedestrian's way alone for his personal safety and convenience has been practically overlooked.

Re-Appraise Pedestrian Safety . . . It is time to reappraise street lighting for pedestrians; to consider needed illumination levels for night travel on foot with various degrees of safety and convenience; and to discuss the evolution of lighting equipment suited to this application.

Much evidence exists that the importance of street lighting for pedestrians only is far greater than has been generally supposed. In fact, it appears that most installations using smaller lamp sizes and comprising a numerical majority of all street lights serve primarily as pedestrian lighting.

Let us consider the following:

1. Traffic safety lighting is not fully effective below an average intensity of 0.5 ft-c or better. This generally calls for lamps not smaller than 6,000 lumens with 150-ft maximum spacing. White way lighting requires still higher intensities.

2. The average size of all street lighting lamps in the United States is less than 2,500 lumens.

3. If the presently installed low intensity lighting were unsatisfactory it would be relatively easy, with the excellent equipment and skills available, to increase lamp sizes and illuminating intensities to much greater values at

very little cost. Thus, increasing the average 1,000-lumen unit to 2,500 lumens will give us a 150% increase in light for approximately 15% rise in average annual cost.

4. Despite the foregoing, such increases are extremely difficult to sell in many municipalities. This resistance bespeaks the fact that certain of the existing small lights are relatively satisfactory to the users, and thus serve primarily as pedestrian rather than traffic lighting.

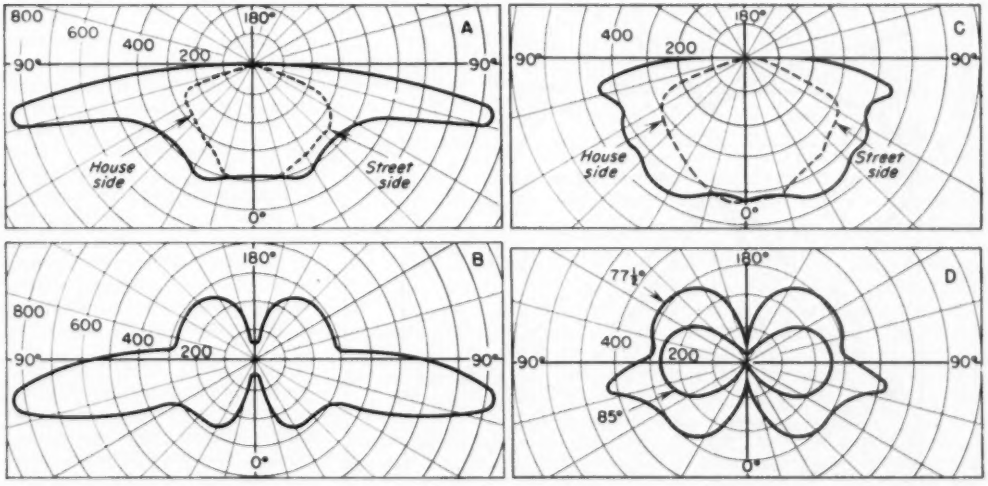
We believe that roughly one-half of the street lights in the United States today still function as lighting units for pedestrian service.

TWIN LUMINAIRE UNIT for intersection lighting, with background shielded helmet

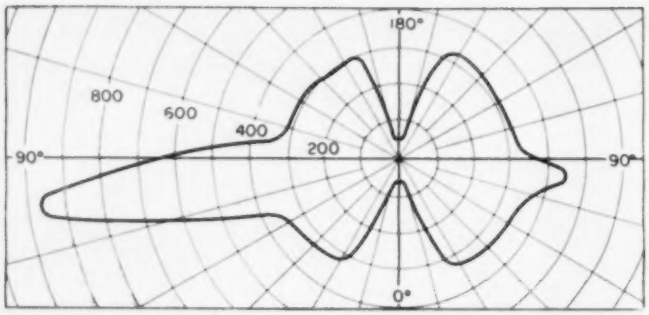
Basic Ideas on Pedestrian Lighting . . . On moonless overcast nights and in locations remote from the skyglow of cities and away from all kinds of artificial illumination, the natural illumination can be insufficient to produce any retinal sensation whatever. Under such conditions a nocturnal pedestrian is in effect completely blind to his surroundings and can only proceed by feeling the way with hands, feet, and stick. This is always extremely dangerous and impractical unless the way lies through known territory and is short.

Minimum artificial lighting under the above conditions is of the "beacon" type. This needs only to be of sufficient intensity for direct perception by the eye and for directional bearing to the person on foot. It provides no perceptible local surface illumination. It is found in practical use where isolated lamps are located at long intervals on country roads or at remote rural intersections. Night travel, though aided by beacon lighting, is barely safer under these conditions than with no lighting.

Next and more common level of illumination is that perceived by the rods of the eye, known as scotopic vision. At intensities under 10^{-4} ft-c, vision is extemely scotopic; the eye cannot perceive color or fine surface detail. Nature has given the eye this imperfect yet highly sensitive seeing faculty to allow locomotion under commonly prevailing night conditions. Such illumination is provided between bare 1,000-lumen lamps at spacings of 300 to 500 ft or more. Vertical surfaces only are visible and horizontal illumination is nil except near the lights. Surprisingly, night travel under the foregoing is not unduly difficult or exceptionally hazardous, though it



CANDLEPOWER CURVES for background-shielded reflectors using 2500-lumen series lamp. (A) Vertical distribution in plane of maximum candlepower and transverse with edgeflectors. (B) Lateral distribution in cone of maximum candlepower (77.5 deg) with edgeflectors. (C) Same as (A), but without edgeflectors. Also without edgeflectors is (D) which is same as (B) with distribution in 85-deg cone added. Comparison of (A) and (B) with (C) and (D) shows how edgeflectors recover light from the field and street sides of reflector, from directly below the unit as well as by indirect action, and project it to the street surface at high angles



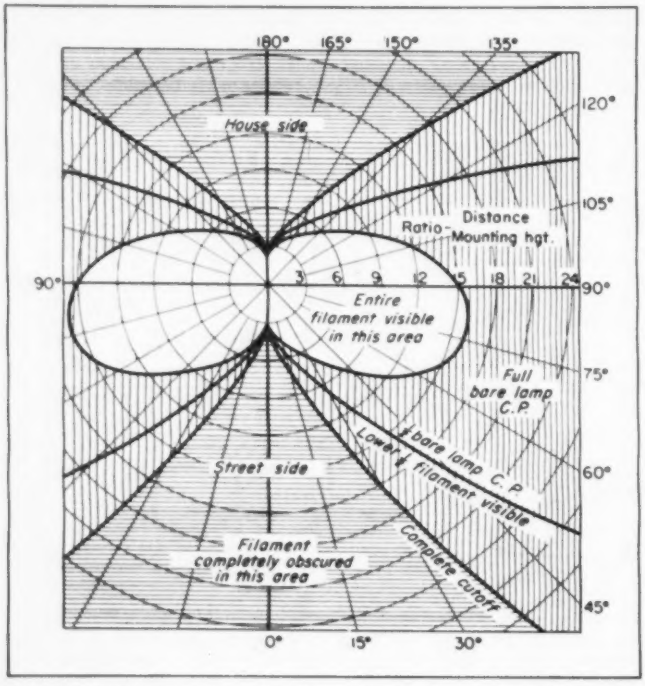
LATERAL CP DISTRIBUTION in 77.5 deg cone for uni-directional helmet reflector (one edge-flector only with 2,500-lumen series lamp. This shows how the reflector can be modified to become a uni-directional unit for lighting dead-end intersections and sharp street bends

cannot in any sense be called "safety lighting." This will be called "guidance lighting." A very substantial percentage of present day street lighting is of this type.

Pedestrian Safety Lighting . . . The photopic range of ocular vision comes into play with most eyes at above 0.01 ft-c. At this level the fovea functions and fine detail and color can be seen. Such illumination is obtainable with 1,000-lumen bare lamps on 200-ft spacing or with 2,500-lumen bare lamps on 300-ft spacing (or every three line poles) and is the minimum that can be considered as "pedestrian safety lighting." The average horizontal illumination from bare lamps under such conditions is about 0.05 ft-c.

The horizontal intensity midway between bare 2,500-lumen lamps on 300-ft centers is still very low and of the order of 0.003 ft-c. For this reason the concept of horizontal illumination could well be dropped from consideration in all appraisals of pedestrian safety lighting. Visibility under such lighting is afforded primarily by illumination of vertical surfaces like tree trunks, posts, shrubs, hummocks, walls, fences, and buildings. It would be preferable to present luminaire data for such purposes in terms of vertical rather than horizontal illumination.

A luminaire designed primarily for pedestrian lighting would require a vertical light distribution pattern having its maximum cp at and immediately below the horizontal. Cutoff would occur as closely above the horizontal as practical design would permit. To inhibit glare, the pavement illumination under the luminaire would be roughly one-third maximum, in accordance with the best modern American practice.



SHADOW PATTERN cast on street surface by lower rim of background shielded helmet reflector, using 1,000-lumen, 6.6-amp series lamp. Not a cp curve. Reflected light not included

Equipment for Pedestrian Lighting . . . From around 1916 to 1946 the "radial wave" reflector was in substantially universal use for pedestrian guidance lighting. This did little to reinforce the illumination at the higher vertical angles. The exposed lamp filament with neither obscuration nor background shielding produced strong glare.

In 1945 and 1946 a new reflector type called the "helmet" reflector came into general use in the above field. It brought two improvements. The filament was shielded by obscuration above the 80-deg vertical angle and the reflector was generally made oval. In some designs, supplementary shielding was applied transversely to the street to protect dwellings from excessive stray light. These reflectors were generally designed for mounting on centers not exceeding 200 ft and when so applied were a considerable improvement over the radial wave type.

Unfortunately helmet reflectors were in many cases misapplied by installation on over 200-ft spacings or at isolated locations where beacon or pedestrian guidance lighting had been used. As they were substituted for radial wave units at such places complaints arose, since the obscuration shielding destroyed both beacon and

(*Continued on page* 184)

LOUISIANA'S GOVERNOR Robert F. Kennon, center, driving home a point in conversation with AIEE President Donald A. Quarles. Looking on, left, is Henry J. Voorhies, vice-president, Standard Oil Co. All three addressed the opening session of the Fall General Meeting

AIEE Tackles Aluminum

Foreign and domestic practices in application of aluminum to cables, buses, and open wire draw heavy emphasis. Power generation topics a close second at Fall General Meeting

"How to use aluminum" was clearly the fair-haired topic at the AIEE Fall General Meeting in New Orleans, October 13-17. There were 12 papers and numberless discussions on the subject—more than any other single topic. They tackled problems of splicing, connecting, and applying aluminum as insulated cable, open wire, and bus conductors. Foreign practice was explored and domestic experience studied for clues. Out of it all, the impression was one of intense activity, narrowing areas of controversy over connections, and a determination to catch up with copper know-how.

H. W. Biskeborn, Kaiser Aluminum and Chemical Corp, said European utility engineers and cable makers favor in order; autogenous welding, pressure connections, and soft soldering for connecting aluminum cables. R. J. Wiseman, Okonite Co, and others felt autogenous joints require too much heat for the good of insulation; soldering takes too long (7-8 min); and "alutherm" type joints too much flame for safe manhole use. E. W. Greenfield, Kaiser Aluminum, said aluminum soldering is of three types—friction, flux, and reaction—all difficult. He presented a tabulation of 40 solders and fluxes for use with aluminum.

Robert Nordell, Sieverts Kabelverk, said Sweden hasn't used insulated aluminum to date but for connections favors compression methods. An economical and technical solution to extrusion of aluminum cable sheaths is needed. Swedging isn't favored, he said. Wiseman said Germany and Britain are experimenting with extruded aluminum cable sheaths. The Germans make an aluminum tube bigger than the cable, swedge it down; British swedge and plan to extrude.

Wiseman said Europeans neglect compression joints because they do not appreciate the need for either longer sleeves (than for copper), multiple indents, or high compression pressure. H. P. Dupre, Burndy Engineering, said Europeans make no effort to remove oxide. This too may explain why they use fewer clamp or compression joints more.

C. P. Xenis said tests by Consolidated Edison on aluminum buses and stacked aluminum strips show that contact resistance is a minimum at 18,000 psi and stays low when pressure is cut to 1,000 psi; that inhibitors cut contact resistance particularly at

LAST MINUTE DETAILS for the Fall General Meeting of AIEE get a going over by most committeemen. With chairman J. M. Todd are, left to right, vice-chairmen C. P. Knost, Moloney Electric Co; B. E. Segall, Best Electric Co; and B. P. Babin, Westinghouse Electric Corp

Standard insulation levels, auxiliary power needs, and safety get AIEE emphasis

the lower pressures; that movement between surfaces tends to reduce contact resistance; that on bus connections use of inhibitors must be combined with contact pressures maintained by steel bolts and Bellville type spring washers to compensate for creep. E. J. Casey, General Electric, cited data indicating that similar silver-plated aluminum joints held their initial resistance better than Xenis non-plated joints under load cycle tests but non-plated joints showed increases of 385-500%.

E. J. Casey and N. Swertlow, GE, showed that an electrically equivalent station bus of aluminum will weigh one-half as much as copper and, by taking advantage of the greater effective depth of current penetration, a thicker, hollow conductor of 70% more cross section area and the same resistance can be made to occupy the same space.

Aluminum Cable Needs Special Care

C. W. Zimmerer reported that Underwriters Laboratory tests showed circuit carrying capacity of selected insulated EC grade aluminum conductors to be 78% of respective copper conductors with the same insulation. E. G. Sturdevant, U. S. Rubber, concurred, noting however that the National Electrical Code permits such conductors to be operated at capacities of 84% of copper conductors.

In two conference papers on insulated aluminum cables—one on characteristics, the other on their application—E. E. McIlveen, Okonite, made these observations: For all-round performance three-quarter hard temper is best for manufacturing, installation and connecting; with a 40% higher expansion coefficient than copper good practice suggests allowance be made in manholes for extra cable movement; aerial cable is one of the more desirable applications of insulated aluminum; compression type fittings are more or less foolproof and give good performance as terminals, straight connectors or tees.

Tests of fittings on insulated aluminum cable, reported by Joel Tompkins and E. K. Lanetot, Aluminum Co of America, again demonstrated the superiority of hex and circumferential compression connections on large sizes. On stranded sizes around No. 12 and No. 10 test shows the indent type is better when dimension tolerance of wire and fitting are close. But on small solid wire, test showed the indent may weaken the conductor; then hex and circumferential is better.

Discussing resistance of clamp-type cable fittings, W. F. Bonwitt, Burndy, found that after 5 years exposure to severe industrial fumes tinned copper alloy connectors performed satisfactorily as did bare aluminum alloy connectors. Copper alloy connectors had a slightly lower resistance than aluminum. Galvanized hardware seemed unsatisfactory; silicon bronze satisfactory if tin plated.

Toward Standardization of Insulation Levels

Among changes in insulation coordination practice in the U. S. proposed by Westinghouse engineers C. F. Wagner, R. L. Witzke, E. Beck and W. L. Teague, as a step toward standardization of insulation levels, were: (1) Use a 15% plus 30-kv margin for substation application between the BIL of protected equipment and the maximum arrester characteristic (for a 5000 amp 10 x 20 microsecond wave); (2) that the number of system voltages in the 12 to 14.4-kv range be reduced and (3) systems be designated in terms of the maximum voltage at which it would be called upon to operate. In discussion J. A. Elsi, Commonwealth Services, felt use of arrester characteristics for a discharge of 5000 amp is suitable for transmission and subtransmission but felt exposure of 2,400 to 14,000 volts called for an arrester characteristic based on 10,000-amp discharge.

Radio influence was cited as a heavy deterent in the size of conductor at various elevated transmission voltages

according to S. B. Griscom, A. A. Johnson, and Miles Maxwell, Westinghouse. In evaluating extra high voltage transmission, ice melting, they said, may limit voltage on some circuits. Where power flow is upwards of 1,000,000 kw voltages up to 440 kv were considered feasible. P. L. Bellaschi warned that 230 kv can't be relegated to a secondary position but will give real competition to 345 and 400 kv. Radio influence indicates a minimum conductor diameter of 1.6 in. for 345 kv, 1.4 in. for 300 kv. Above 345 kv bundle conductors seem advantageous.

Fact that electrostatic unbalance of untransposed overhead transmission lines can be reduced and in some instances eliminated by altering the relative elevation of the middle conductor and other phase conductors was demonstrated in a conference paper by E. T. B. Gross, Kay Berman and C. T. Went, Illinois Institute of Technology.

Problems inherent in series solenoid operated reclosers were solved by using a shunt operating closing solenoid in a new three-phase oil circuit recloser described by A. Van Ryan, Line Material Co, which operates its poles simultaneously regardless of fault type. J. W. Graff, Alabama Power, characterized the 4000-amp rated recloser as a better interrupting device than a conventional 100,000-amp breaker and particularly suitable for 3750-to 5000-kva substation applications. Among its limitations he listed inability to tell what phase caused lockout, lack of protection on the shunt solenoid, a fixed reclosing cycle, and inability to use sensitive ground fault relaying.

Behavior of a fuse link under a series of repeated faults follows a predictable pattern described by R. E. Riebs, Line Material. Author Riebs' method determines whether a fuse will blow or be damaged by a given sequence of repeated faults or remain undamaged. Damage to the link can be predicted for faults of insufficient duration to cause blowing.

Auxiliary Power Needs Growing

Within a few years the auxiliary power required for a single generating unit may rise to 30,000 kw or even more because of the assured increase in turbine-generator ratings. A. G. Mellor and R. A. Schmidt of General Electric Co said that present circuit breaker ratings could handle this requirement by resorting to three 4,160-volt buses. They felt the systems would continue radial and that motor sizes need not present a serious voltage regulation problem at 4,160 volts. Nor did they see any justification for shaft generators or separate turbine generator sets for auxiliary supply. Connection direct to generator terminal should continue adequate.

On the other hand, R. W. Ferguson of Westinghouse Electric Corp sensed a dilemma arising from contradictory requirements. Thus maximum allowable voltage drop during transfer of the auxiliary load from one power source to another dictates a certain value of source reactance while the limited interrupting ratings of standard breakers may dictate a different reactance. They focussed attention on the merits of a duplex reactor as a possible escape from the dilemma. It can be designed to have low reactance to balanced load currents flowing during normal operation and to the high resumption current following a bus transfer. But it can present a relatively high reactance to fault currents flowing only in one leg or from one leg to another.

Also by dividing the load among several spot networks it should be possible to raise the top horsepower at 480 volts to 500 or 750 hp and use only 2,300 volts for the larger motors at a saving of some 20% in cost by comparison with 6,600-volt motors. R. W. Gaskins, Union Electric Co of Missouri, rated the duplex reactor a constructive escape from the higher cost of higher voltage auxiliary systems. Query why a 3-winding transformer (but plus two auxiliary voltage levels) could not be resorted to as a means of introducing protective reactance was raised by F. W. McCloska, Sargent & Lundy.

At the Encina Station of San Diego Gas & Electric Co the midpoint of the 440-volt system will be grounded in the hope that it will eliminate multiple failures from arcing ground overvoltages. J. F. Sinnott of the company in conjunction with T. H. Jacobsen of Pioneer Service & Engineering added that the midpoint grounding will also permit the use of 277-volt ballast for the fluorescent lighting of the turbine room ceiling. A sizeable saving is forecast.

Study Application of Auxiliary Motors

Application recommendations for major auxiliary motors were propounded by four General Electric coauthors (J. H. Ashby, A. E. Beardmore, R. C. Goodwin and H. G. Schiff). Principal conclusions were that (1) ambient and not motor duty determine type of motor enclosure, (2) low-impedance transformer of generous kva rating is an antidote for

S. J. Rosch, Anaconda Wire & Cable Co; E. E. McIlvean, The Okonite Co; C. W. Zimmerer, Underwriters Laboratories; and E. G. Sturdevant, U. S. Rubber Co

H. W. Biskeborn, Kaiser Aluminum & Chemical Corp; C. T. Hatcher and C. P. Xenis, Consolidated Edison Co of New York

J. W. Graff, Alabama Power Co; A. A. Johnson, Westinghouse Electric Corp; and W. R. Brownlee, Southern Services Inc

voltage dip, (3) large boiler feed pump and induced-draft fan motors warrant adjustable-speed drives, (4) moderate overloads should merely sound an alarm with tripping confined to short circuits and stalling.

At Phillips Power Station of Duquesne Light the auxiliary power system has a protective scheme with ability to discriminate between load transfer and fault conditions. It has satisfactory sensitivity and reasonable fault clearing speed reported G. B. Dodds and W. E. Marter. It employs a distance relay having a reactance-measuring distance element and a starting unit with offset circle characteristics. Distance relays were asserted to provide a back-up for feeder breakers and relays not obtainable by bus differential protection.

Advantages of tray and trough supports for control and power cables listed by the late F. S. Benson, Pacific Gas & Electric, emphasized inspection availability, adaptability for change, lower cable temperature, layout flexibility and low cost. Disadvantages are ease of sabotage, short circuit contagion, and exposure to high temperatures.

Add Push-Pull to Pole-Top Resucitation

Pulmonary ventilation in pole-top resuscitation can be enhanced 50% by adding push-pull technique to the standard procedure according to three members of the University of Illinois Medical College faculty (A. S. Gordon, Charles Faye and M. S. Sadove). Studies conducted on five males convinced them further that the double-rock form of push-pull is superior as to ease of performance, rhythm and operator fatigue. In it, the rescuer rocks forward as he compresses the victim's abdomen and backward when he raises the victim's arms to tense the pectoral muscles.

E. W. Osterreich, originator of the pole-top resuscitation technique, said that of the seven successful cases (there have been none unsuccessful) in 20 years on the Duquesne Light system only two were orthodox in the sense that the rocking procedures could have been added. Either the working space among energized wires or the unpropitious position of the victim interfered in the others. While not opposing the push-pull supplementation he could not help concluding that, (1) the plain pole-top method is not at all inadequate, (2) greater pulmonary ventilation may promote ineffectiveness from over-oxygenation, (3) space is often cramped and (4) it is not feasible for a small rescuer to apply the push-pull or rocking movements to a large victim.

Employment of a cold cathode camera tube in industrial television equipments has gone far toward giving longer tube life in 24-hour service and much less maintenance than conventional domestic television sets could give. The simplification, however, is achieved at some sacrifice, said G. H. Wilson of Diamond Power Specialty. He added that if television is to be applied in a power plant for boiler and stack supervision much money can be saved structurally if provision for line-of-sight openings can be omitted from the start. It was intimated that watchmen and guards will be given television to enhance the scope and continuity of their observations.

Early Troubles with TV in Power Plants

Early difficulties with television on the Long Island Lighting system have been corrected in a developmental way, said L. M. Exley. Pictures of combustion are now obtainable at all rates of coal firing and boiler loading. In fact dimming of pictures is now taken as an index that combustion is either lacking or faulty. It has been demonstrated that television is a fine tool for training new operators.

Television equipment needs to be designed to avert the inherent dust-precipitation propensities of its high voltage dc circuits, said E. R. Thomas, Consolidated Edison Co, if undue maintenance is not to be incurred.

Closer spacing of channels is resulting from increased demand in the carrier and microwave channels. Unfortunately attempts simultaneously to increase the number of control functions within a given frequency band result in inevitable lengthening of the response time as each function is allotted less of the band-width. This was emphasized by J. S. Smith of General Electric Co. Selectivity must be high for reliability to guard against spurious signals from adjacent channels.

WASHINGTON COMMENT

JESSE MOCK

Since its inception in early 1950, the fledgling Southeastern Power Administration has been a keen disappointment to its bureaucratic parent the Department of Interior.

Reason is that Interior is dead set on expanding federal power holdings in the South, but Sepa has been notably unsuccessful in obtaining funds for this purpose. Despite pleas to Congress for nearly $8 million to begin a federal transmission network in the area, Sepa has ended up with less than $1 million. This comparatively small amount is to be spent only as a last resort.

Interior Puts the Pressure on Sepa

Interior Department Pushing Sepa to Get Action . . . It is little wonder then that the aggressive Interior Department has now moved in to shake Sepa out of its lethargy and start building at least one transmission line in South Carolina. Its method appears wide open to question on both legal and administrative grounds, but Interior must believe it is worth the risk.

Here is the situation:

Congress this year appropriated $844,500 to Sepa for construction of a 115-kv transmission line from Clark Hill Dam to Greenwood, S. C. However, it prohibited the use of this money until:

1. Sepa had exhausted all efforts to enter reasonable wheeling contracts with "the affected power companies in the area. . ."

2. Sepa had so informed Congress. In letters dated Sept. 15 to the Vice President and the Speaker of the House, Interior Secretary Oscar L. Chapman said he was informing Congress that the "restrictions on the availability of appropriations for the construction of the transmission line in question are no longer applicable."

This letter explained that Sepa had contacted South Carolina Electric & Gas Co in whose nominal service area the 41-mile disputed transmission line is to be built. This company had agreed to system-wide wheeling, Chapman reported.

Duke Power Brought into the Picture . . . Sepa also contacted Duke Power Co, whose service area extends to the vicinity of the Greenwood terminal of the proposed line. Duke Power Co had telegraphed Sepa in reply that it was willing to participate with South Carolina Electric & Gas Co in providing transmission facilities for the Clark Hill-Greenwood connection but asked for further discussion before entering a system-wide wheeling contract. Another brisk exchange of telegrams brought from Duke the reply:

"With no more information of your plans than we have, it is of course impossible to give a categorical answer to your inquiry as to whether this company will transmit 50,000 kw of power for the account of the government on a system-wide basis . . . We will be glad to discuss these matters with you."

From these telegraphic communications, Chapman made the following conclusions:

"I find that the construction of this line will not affect South Carolina Electric & Gas Co's operations in any manner as it does not provide for delivery of any power into the company's territory either to the company or to any other customer in its territory.

"The Duke Power Co is an affected company because the proposed line has delivery facilities in the area of that company. The Duke Power Co has refused to indicate a willingness to enter into a contract for system-wide transmission of electric power and energy from government projects to preferred customers."

Comptroller General Lindsay Warren, Congress' watchdog for the federal treasury, has been asked to study the Secretary's action and determine whether it complies with the law. At this writing it appears likely the courts may also be asked to look into this affair.

At the very least, it does show the lengths to which Chapman is prepared to go in order to begin building his federal transmission network in the Southeast.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Series capacitors will be useful in modulating line reactance so as to achieve a desired load distribution between several parallel circuits in an interconnected network.

Accident frequency on utility system not making the use of rubber gloves mandatory has been 23 times as high as on systems that have a hard and fast rule.

Ash handling and disposal is one of the relatively unsolved problems of power plant operation. Expediency seems to suffice as an answer.

Feeder regulators for eight feeders were released for service elsewhere when the function was taken over by three bus regulators costing only 60% as much.

Valve-stem sticking of some of the recent large reheat turbogenerators has been charged to deposits of black iron oxide and pipe scale. Provision for blowing the stuff out in advance is fine forethought.

Terrazzo flooring showed resistance of 4.5 megohms at 30 v but only 1.5 at 500 v. Conductive linoleum changed from almost 3 megohms at 40 v to less than 10,000 ohms at 150 v, showing high effectiveness for dissipating static electricity.

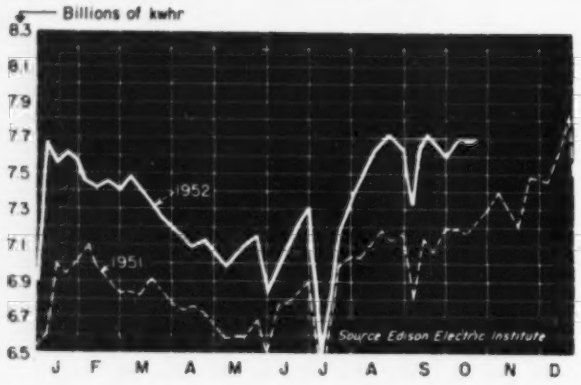
Barium titanate cylinders 12 cm long vibrate longitudinally at 18 kc (a million times a minute, a billion in 17 min.) This transducer can be used to make accelerated wear tests.

Gasification of pulverized coal by means of steam and oxygen to produce carbon monoxide and hydrogen for combustion has been demonstrated to be feasible.

Buried service entrance cable offers some risk of tampering for diversion purposes.

Magnetic field strength (also gradient) can be determined by employing the longitudinal vibrations of a barium titanate cylinder when electrically excited. The motions carry an exploring coil back and forth across the field.

STATISTICS



Output Week Ended Oct. 25—7,696,243,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Oct. 25	+6.4	+10.6	+4.8	+5.9	+8.8	+10.2	+5.8	+6.9	−6.4	+10.3
Oct. 18	+7.4	+7.7	+5.4	+8.7	+9.7	+10.8	+7.1	+8.9	−6.1	+10.4
Oct. 11	+7.5	+10.6	+5.3	+7.3	+8.6	+11.2	+7.9	+9.4	−3.3	+10.2

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	July	67.2	67.0	63.1
Capacity (Million Kw)	Aug.	78.31	77.96	73.62
Production (Billion Kwhr)	Aug.	34.36	32.52	32.40
Hydro		8.52	8.74	7.82
Fuel		25.84	23.78	24.51
Fuel Consumption				
Coal (Million Tons)	Aug.	8.57	7.90	8.96
Oil (Million Barrels)		5.38	4.38	5.12
Gas (Billion Cu Ft)		104.97	98.71	88.46
Sales (Billion Kwhr)	July	27.70	27.67	26.50
Residential		7.50	7.44	6.55
Commercial		5.30	5.00	4.70
Industrial		12.64	13.20	13.13
Other		2.25	2.03	2.12
Net Income Class A & B Companies ($ Million)	Aug.	68.67	64.62	53.33
Estimated Dec. 52 Peak (Million Kw)	July	80.1	80.0	78.8
Kwhr per Residential Customer (12 Month Average)	July	2,104	2,091	1,933
Revenue per Kwhr Residential Service (12 Month Average)	July	2.78¢	2.78¢	2.84¢
Canadian Production (Billion Kwhr)	Aug.	4.97	4.84	4.60

Business Statistics

FRB Industrial Production Index†††	Sept.	228	218	223
Gross National Product Annual Rate ($Billion)	3rdQtr.	344.0	343.2	337.1
E. W. 5 Industry Production Index	Sept.	123.5	120.5	123.5
ENR Construction Cost Index††	Oct.	123.3	122.9	114.6
BLS Consumer's Price Index	Sept.	190.8	191.1	186.6
NEMA Insulation Materials Sales Index†	Aug.	451	470	539
NEMA Electric Appliance Sales Index†	Aug.	236	234	210
NEMA Household Refrig. Sales Index†	Aug.	148	197	97
Metal Prices, (Oct. 28)				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.13½	.14	.19
Zinc, prime Western E. St. Louis, lb		.12½	.13½	.19½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.03
Aluminum, ingot, base price		.20	.20	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Households Increasing Faster Than Population

The rate of growth in the number of housholds since World War II has continued its long term tendency to exceed the rate of population growth.

That the size of the averege American household has declined sharply since 1947 despite the high birth rates of the intervening years is borne out by the advance results of a survey announced recently by the Bureau of the Census.

The effects of high birth rates, the Bureau reports, were more than offset by the effects of the relatively high marriage rates, the large volume of housing construction, and other factors associated with the high level of economic activity that tended to increase the number of households.

The record number of births added youngsters to households and thus tended to increase the population in households. On the other hand, the postwar marriage boom undoubtedly resulted in a substantial number of new but small households. Further, the high level of economic activity probably tended to reduce the size of household by enabling some married couples and other persons, particularly those in their later years, to live in their own homes instead of with relatives or nonrelatives. The increase since 1947 in the size of the armed forces tended to reduce somewhat the population in households.

Between April 1947 and April 1952, the average number of persons per household shrank from 3.55 persons to 3.33 persons. At the time of the 1940 Census, there were 3.67 persons per household and in 1890 there were 4.93 persons.

Close to 70% of American households are located in urban areas, 20% in rural-non-farm areas, and the remainder in rural-farm areas.

Households and Population

	Households (Millions)	Population in households (Millions)	Average per household
April 1952	45.5	151.6	3.33
Urban	30.7	97.9	3.19
Rural nonfarm	8.8	29.9	3.39
Rural farm	6.0	23.8	3.96
April 1951	44.6	148.7	3.34
March 1950	43.5	147.3	3.39
April 1949	42.1	144.2	3.42
April 1948	40.7	142.2	3.49
April 1947	39.1	139.1	3.55
April 1940	34.9	128.4	3.67

A Statement of Principles in Accelerated Amortization

This statement was prepared by accounting divisions sections of Edison Electric Institute and American Gas Association. It is applicable to accelerated amortization of emergency facilities in regulated electric and gas industries.

1. Accelerated amortization of emergency facilities, as provided for under Section 124-A of the federal income tax law, results in material reductions in federal income taxes during the first five years of the life of the plant certified as emergency facilities and increases such income taxes during the remaining life of the properties so amortized. The actual effect of this amortization for tax purposes is not to create a windfall during the amortization period but simply to defer federal income tax payments to subsequent years in order to provide cash to assist in financing such facilities. Congress made these provisions available without distinction to all companies, both regulated and unregulated, as an inducement to construct facilities contributing to the defense effort.

2. The financial assistance made available to regulated utilities from accelerated amortization should not be denied to them by regulatory commissions in rate determinations or through restrictive accounting requirements. To do so would deprive regulated companies of the benefits which Congress intended them to enjoy in common with unregulated companies and would thereby defeat the purpose of the law.

3. Since the tax reductions derived from accelerated amortization during the five-year amortization period will result in higher federal income taxes during the remaining life of the properties so amortized, this fact should be recognized by considering these reductions as not being available for current dividends. The method of recognition used, whether it be through the creation of a reserve, restricted surplus, or otherwise, should be determined by the circumstances in each company and should be properly disclosed.

4. The regulated electric and gas industries have made substantial expenditures in constructing facilities contributing to the defense effort on the basis of retaining the tax benefits which Congress granted to them through accelerated amortization. It is essential, therefore, that regulatory authorities recognize the basic principles set forth above in their rate making and accounting procedures. Failure to do so will create serious problems in carrying out long-range financing programs.

Electricite de France Offers Electric Dividends

PARIS (McGraw-Hill World News)—A new type of loan was floated in October by Electricite de France, the nationalized electricity authority, offering subscribers of the debentures a dividend pegged to the selling price of power.

Actually the purchaser buys what is called a "production share." Priced at 16,000 francs, these entitle the holder to an annual return on the debentures equal to the average annual selling price of 100 kwhrs. There is a guaranteed minimum annual payment of 720 francs.

The debentures have a life of 15 years. They can be redeemed any time after July 15, 1958 either at the option of the holder or by the drawing of lots by Electricite de France.

In the latter case the payment is to be equal to 20 times the value of 100 kwhr due the year of the drawing. The minimum payment is to be 16,000 francs.

If the debentures are redeemed by the holder, the payment will be the 16,000 francs which is the original price paid.

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New Texas Utility to Run Alcoa's Power Plant

Texas Utilities Co will organize a new corporation to be known as the Industrial Generating Co.

It will be organized in Texas. TUC will acquire five shares ($100 par) of the capital stock for $500. The new company will operate on a non-profit basis.

It will contract with Texas Power & Light Co, an affiliate, to perform the obligations of TP&L to Aluminum Co of America imposed by the contract between the latter two companies to operate Alcoa's generating plant near Sandow, Tex.

TP&L said that the new company is being formed because its financial statements would be substantially distorted if the operating costs of Alcoa's plant were included with its regular normal operations.

FINANCIAL BRIEFS

Stockholder Subscriptions: Sierra Pacific Power Co stockholders have taken 23,218 common shares of 26,775 shares offered on a 1-for-6 basis for preferred holders and 1-for-12 for common holders at $23 per share to yield 6.96%. Remaining 3,557 shares were taken by the underwriters headed by Stone & Webster Securities Corp and Dean Witter & Co.

Common Dividend Increases: Arkansas-Missouri Power Co will pay Dec. 15 a quarterly dividend of 27½¢ a share as compared with 25¢ in the previous quarter . . . Wisconsin Electric Power Co will pay Dec. 1 a year end dividend of 42½¢ per share making $1.40 in 1952 versus $1.30 in 1951.

Citizens Utilities Co has placed privately $1 million first mortgage and collateral trust bonds 3⅞% due 1982 and $1,350,000 in 4½% debentures due 1977 through Carl M. Loeb Rhoades & Co.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Oct. 23	**3.02**	**3.07**	**3.19**	**4.07**	**4.30**	**4.62**	**5.23**	**5.67**	**6.14**
Oct. 16	3.01	3.07	3.18	4.11	4.29	4.62	5.31	5.66	6.13
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
					$	$
Arkansas Power & Light	12	Sept.	$5,980,150	$4,541,091	2.72(a)	2.85(a)
Central Illinois Light	12	Sept.	2,951,106	3,064,167	2.72(a)	2.85(a)
Detroit Edison	12	Sept.	16,119,239	15,538,449	1.62(b)	1.72(b)
Houston Lighting & Power	12	Sept.	8,302,294	6,465,850	....	....
Jacksonville, Fla., Electric system	9	Sept.	5,708,082	5,184,019	....	....
Long Island Lighting	12	Sept.	6,053,347	4,294,642(e)	1.31(c)	1.27(c)
Louisiana Power & Light	12	Sept.	2,983,211	2,521,080	....	....
Mississippi Power & Light	12	Sept.	3,708,475	2,987,193	....	....
Mountain States Power	13	Aug.	1,493,160	1,413,313	1.05(f)	1.23(f)
New York State Electric & Gas	12	Sept.	7,486,380	5,715,156	2.39(g)	1.95(g)
Oklahoma Gas & Electric	12	Sept.	5,831,344	4,762,392	1.93(h)	1.64(h)
Portland General Electric	12	Sept.	3,650,872	3,329,866	2.66(i)	2.66(i)
San Diego Gas & Electric	12	Aug.	4,222,580	3,549,807	....	....
Southern Indiana Gas & Electric	12	Sept.	1,813,009	1,773,529	2.04	1.99

Notes—(a) Based on 900,000 shares outstanding at end of period; (b) Based on 9,924,023 shares in 1952 and 9,029,603 shares in 1951; (c) Based on average number of shares outstanding during each period; (e) Maintenance includes $672,277 for repairs due to extraordinary storm damage, resulting in reduction of net income after income tax of $389,921; (f) Based on 1,250,000 shares in 1952 and on the average number of shares outstanding in 1951; (g) Based on 2,666,950 shares in 1952 and 2,396,950 shares in 1951; (h) Based on 2,411,945 shares in 1952 and 2,209,180 shares in 1951; (i) Based on 1,375,000 average number of shares outstanding in 1952 and 1,250,000 shares outstanding at Sept. 30, 1951.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF OCTOBER 23-29			
None			
WEEK OF OCTOBER 30-NOVEMBER 5			
None			
SCHEDULE FOR NOVEMBER TO DECEMBER			
Bonds			Bid Date
Long Island Lighting — 1st mtg 1982	$20,000	.....	Nov. 17
Gulf States Utilities — 1st mtg 1982	10,000	.....	Nov. 24
New Orleans Public Service — 1st mtg 1982	6,000	.....	Dec. 15
Common Stock			
Hawaiian Electric — 50,000 sh (being offered commonholders on 1-for-10 basis, record Oct. 3 to expire Nov. 26; no underwriting)	$1,000	$20.00	10.00%*
Pacific Gas & Electric — 78,684 sh (North American Co will sell this stock competitively. It was acquired when North American Utility Securities Corp, a former subsidiary, was dissolved)	.....	.....	Nov. 6
Duquesne Light — 250,000 sh†	.....	.....	Nov. 20
Cleveland Electric Illuminating — 557,895 sh (to be offered commonholders on 1-for-5 basis, record Nov. 24 to expire about Dec. 19)	.....	.....	.....
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Central Maine Power — 1st general mtg	$6,000	.....	.....
Kansas City Power & Light — 1st mtg	12,000	.....	.....
California Electric Power — 1st mtg	10,000	.....	.....
Toledo Edison — 1st mtg	7,500	.....	.....
Central Hudson Gas & Electric—1st mtg	6,000	.....	.....
Florida Power Corp — 1st mtg	15,000	.....	.....
Common Stock			
Central Maine Power	$5,000	.....	.....
Toledo Edison — 500,000 sh	.....	.....	.....

Notes—* Dividends are subject to 2% Hawaiian withholding tax. If this tax is deducted, the yield would be 9.80%. † 170,000 shares will be sold by Philadelphia Co and 80,000 shares will be sold by the company as "new money."

REGULATION

Roy A. West of San Francisco has been retained by the Hawaii Public Utilities Commission as a special consultant on the request of Hawaiian Electric Co for a 12% rate increase. Hearings are expected in December.

Byron D. Woodside is named Director of the Division of Corporation Finance of the Securities and Exchange Commission, succeeding Baldwin B. Bane who becomes SEC executive adviser . . . **Federal Power Commission** has ordered Public Service of Colorado to show cause on Dec. 8 why it should not be found to be a "public utility."

CALENDAR

Pennsylvania Electric Association
Communications Committee, Hotel Syracuse, Syracuse, N. Y., Nov. 6-7; Fall Meeting, Relay Committee, Robert Treat Hotel, Newark, N. J., Nov. 13-14.

National Association of Railroad and Utilities Commissioners
Annual Meeting, Hotel Marion, Little Rock, Ark., Nov. 10-13.

National Electrical Manufacturers Association
Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J., Nov. 10-13.

***Texas A. & M. College**
Public Utility Short Course for Electrical Metermen, Electrical Engineering Department, College Station, Tex., Nov. 10-14.

American Institute of Electrical Engineers
Special Technical Conference on Electrically Operated Recording and Controlling Instruments, Benjamin Franklin Hotel, Philadelphia, Nov. 17-18; Winter General Meeting, Hotel Statler, New York, Jan. 19-23, 1953.

National Association of Corrosion Engineers
Western Region, 2nd Annual Conference, Biltmore Hotel, Los Angeles, Nov. 20-21.

American Standards Association
34th Annual Meeting, Waldorf-Astoria Hotel, New York, Nov. 25.

American Society of Mechanical Engineers
Annual Meeting, Statler Hotel, New York, Nov. 30-Dec. 5.

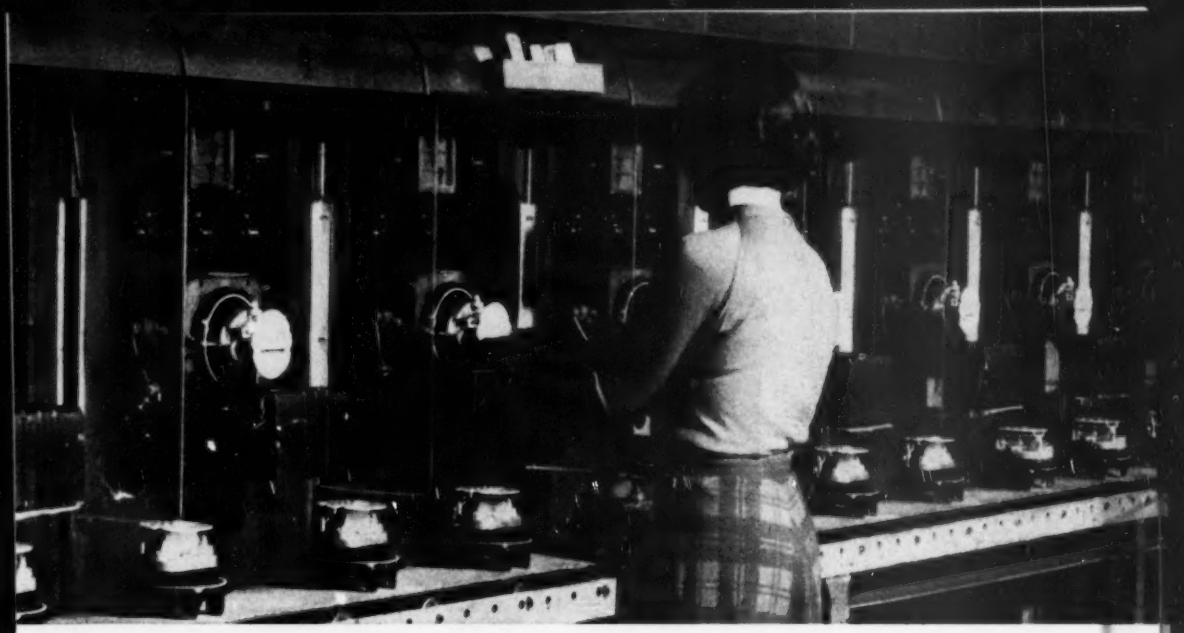
20th National Power Show
Sponsored by American Society of Mechanical Engineers, Grand Central Palace, New York, Dec. 1-6.

Public Utilities Advertising Association
Winter Meeting, Region 2, Claridge Hotel, Atlantic City, N. J., Dec. 4-5.

***Institute of Radio Engineers**
Joint Electronic Computers Conference with American Institute of Electrical Engineers, Park Sheraton Hotel, New York, Dec. 10-12; Joint High Frequency Measurements Conference with AIEE, Statler Hotel, Washington, D. C., Jan. 14-16, 1953.

***Canadian Electrical Association**
Eastern Zone, Engineering Division, Nova Scotian Hotel, Halifax, N. S., Jan. 15-16, 1953; Sales Division, General Brock Hotel, Niagara Falls, Ont., Jan 22-23, 1953; General Division, Mont Tremblant Lodge, Mont Tremblant, Que., Jan. 29-30.

*Addition this week.



G-E I-50 meters, in final factory test. I-50's save you metering costs in many ways. Here's how . . .

Unit Construction of G-E I-50 Meter Saves Calibration, Maintenance Costs

From cover to base, ***integral units*** of construction simplify the certified General Electric I-50 watthour meter. Because no movement of parts can take place within these units, calibration remains stable and the inherent I-50 accuracy is sustained.

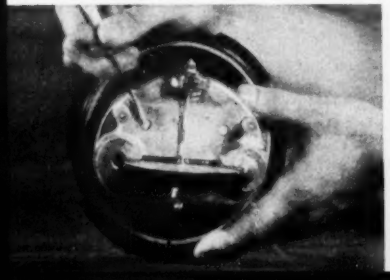
Result: As far as the certified I-50 meter *itself* is concerned, testing costs are reduced. Calibrating time is cut. The long-term stability of I-50 accuracy permits a longer time between periodic tests. Maintenance costs are lessened.

For more information on the savings offered by the certified I-50 watthour meter, call your nearest G-E representative. *General Electric Company, Schenectady 5, New York.*

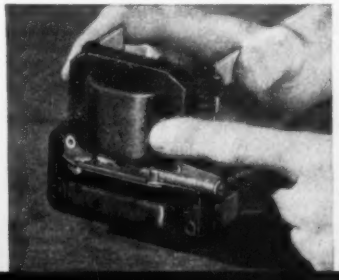
RETARDING MAGNETS of Alnico V are die-cast into frame, firmly fixing them to prevent movement, stabilize calibration.

GENERAL ELECTRIC

STURDY, ONE-PIECE FRAME aligns all operating parts. Four knurled rivets hold stator to frame and prevent movement.



MOLDED COIL INSULATION securely holds coils to laminations, eliminates movement and calibration change in stator.

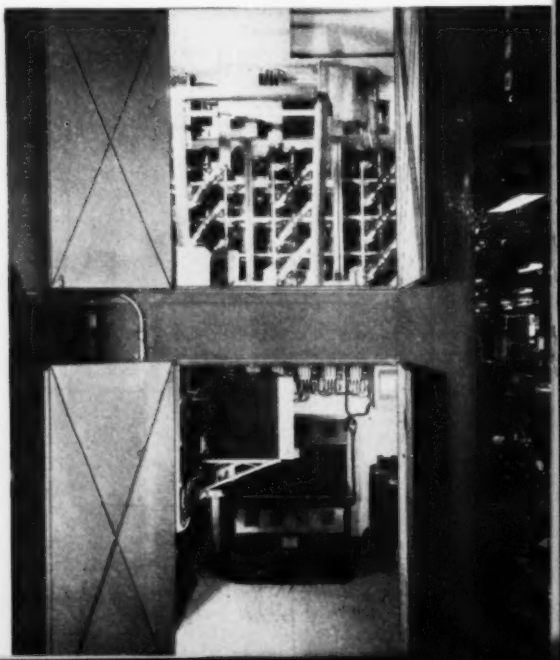


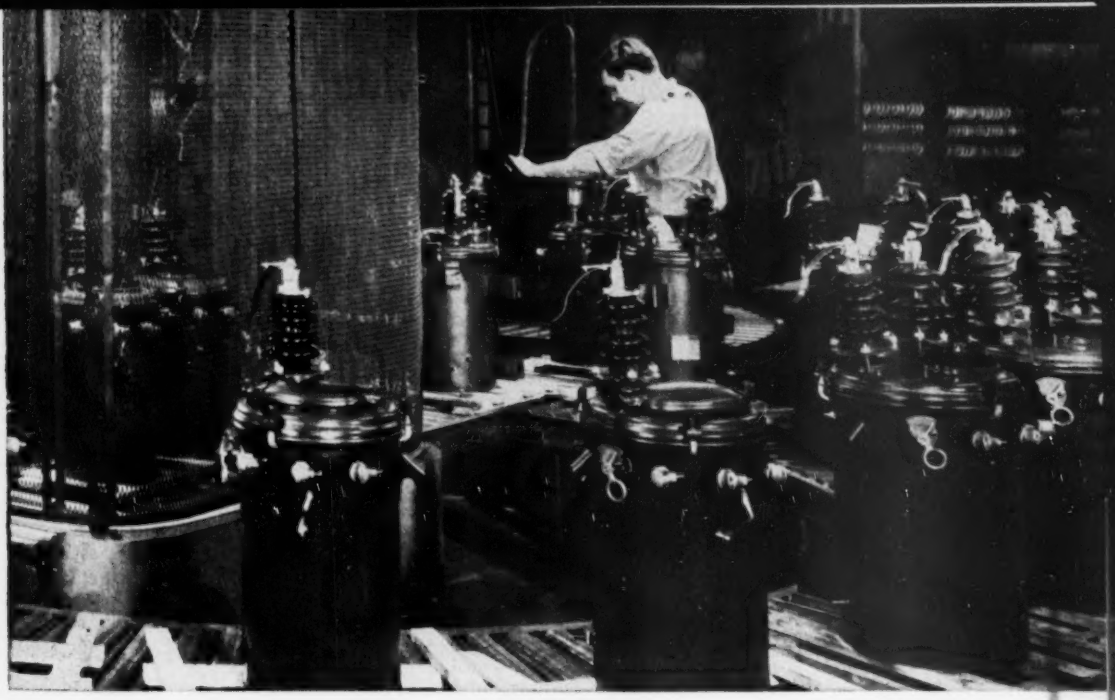
UNIT CONSTRUCTION OF REGISTERS—both pointer and cyclometer—gives mechanism having inherently low friction.

Now...production-line impulse testing

AUTOMATIC DETECTION of even minor faults becomes a reality with new impulse-testing equipment which utilizes neutral-impedance method of fault detection for high-voltage windings.

INTERIOR VIEW of new impulse testing equipment showing impulse generator which performs sequences of operations and fault detection automatically . . . at production-line speed.





for G-E Spirakore* transformers

This new quality-control measure gives you added assurance of "extra years of service"

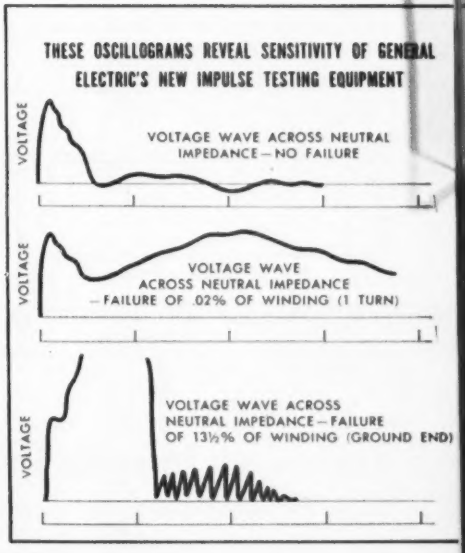
Impulse testing, more exacting than long-established, low-frequency testing procedures, is now being used by General Electric to make sure that your G-E Spirakore transformers will stand up under severe service conditions. More than 185,000 G-E transformers have already been tested right on the production line by this new method.

Production-line impulse testing assures transformers of sound manufacture and provides an additional check on over-all design. Both high- and low-voltage windings are tested without any protective equipment of any kind on the transformer. Any hidden weakness in the transformer is automatically detected and the unit rejected.

TEST RANGE. The equipment now in operation can test all single-phase distribution transformers 100 kva and below with high-voltage windings 18 kv and below, low-voltage windings 600 volts and below.

FOR MORE INFORMATION. GER-635, a reprint of a recent AIEE technical paper, will give you a complete description of this new impulse-testing technique. Ask your local G-E Apparatus sales representative for a copy, or write to Section 402-123, General Electric Company, Schenectady 5, New York.

*Registered trademark of the General Electric Company


THESE OSCILLOGRAMS REVEAL SENSITIVITY OF GENERAL ELECTRIC'S NEW IMPULSE TESTING EQUIPMENT
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE—NO FAILURE
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE —FAILURE OF .02% OF WINDING (1 TURN)
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE—FAILURE OF 13½% OF WINDING (GROUND END)

GENERAL ELECTRIC

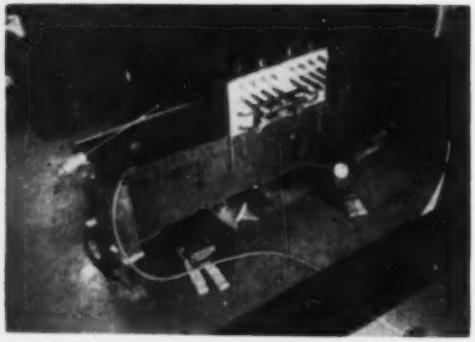


FIG. 1—LOAD BOX built of resistance wire was submerged in water

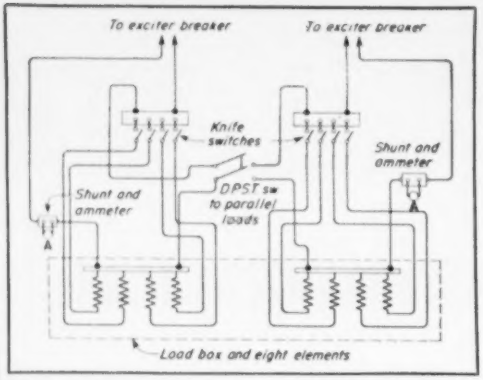
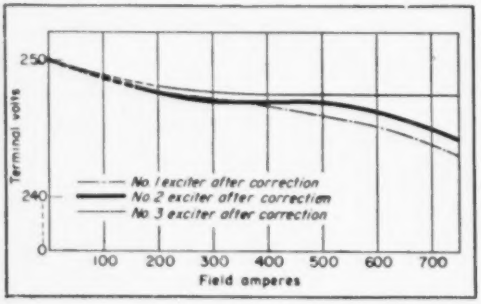


FIG 2—SUBMERGED ELEMENTS were controlled by knife switches



Adjust Exciters for Parallel Operation

LON DONAVANT, JR, Oklahoma Gas & Electric Co, Oklahoma City

Three exciters at the Horseshoe Lake station of the Oklahoma Gas & Electric Co were installed in such a way as to permit paralleling them on a single bus. This permits maintenance on one or two exciters and their auxiliaries while the others furnish station excitation requirements. However, due to differences in compounding characteristics, when the exciters were paralleled there was a tendency for one exciter to grab load, causing an unstable condition between exciters, generator instability and severe system disturbances, conditions which had to be corrected. It appeared that substantial gains in operation could be realized if exciter characteristics could be made to follow more nearly the same pattern under all operating conditions. Accordingly, tests were conducted and the necessary changes in the exciters were made.

In order to establish loads on the exciters such as those encountered in everyday operation a load box was built of resistance wire and this was submerged in running water (Fig 1). By using the load box two exciters were paralleled at a time with loads from zero to approximately 25% overload.

Load boxes consisted of eight elements of approximately 150 amperes each at 250 volts (Fig 2). Water entered one end of the tank in which load elements were submerged and was drained from the other end, carrying away the heat dissipated by the load elements.

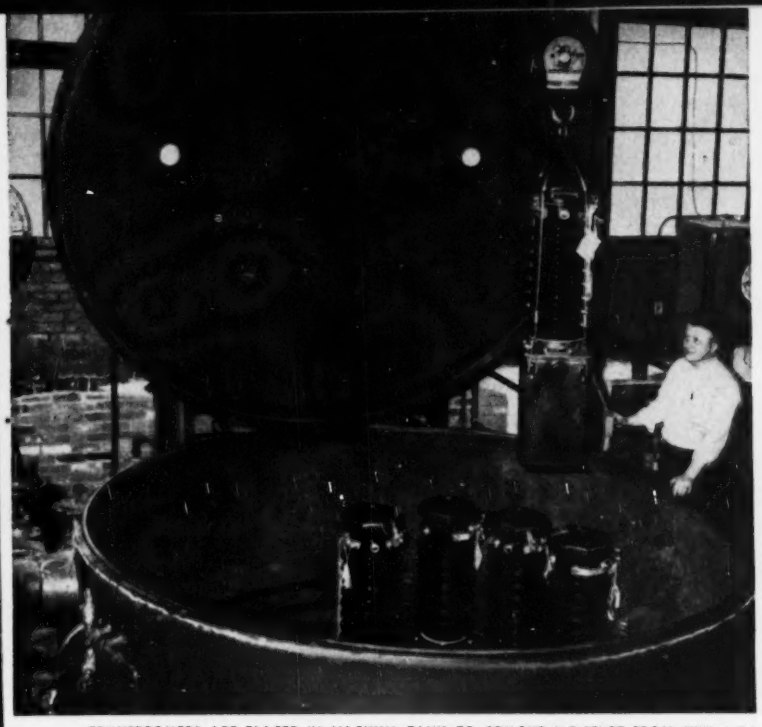
Characteristics of the exciters were changed by changing the amount of current flowing through the series fields. The current was changed by changing the amount of shunt in parallel with the series field and by adjusting the brush shift. Changes were made from time to time as the tests progressed. Curves were drawn of terminal volts vs field amperes of each load test until the same drooping characteristics were obtained for each exciter, and the tendency to grab load had been eliminated.

Parallel tests were conducted with voltage on the machines from approximately 230 to 253 volts and 250 volts appeared best for normal operation. The exciters were paralleled with as much as six volts difference without causing any trouble but at 10 volts difference there was instability. After the exciters had been adjusted the maximum difference in voltage at 550 amp load was reduced to 1.9 volts.

Replace All Fuses By Stick From Ground

WALTER B. MORTON, Station Electrical Engineer, Pennsylvania Power & Light Co, Allentown, Pa.

Outdoor high voltage fuses are used extensively in Pennsylvania P & L's standard substations* to eliminate expensive oil circuit breakers. These fuse applications are made in substations of all voltages up to 138 kv and fuse capacities up to 1,000,000 kva. The stations are automatic and unattended, so fuse replacements must be made quickly from the ground without waiting for instructions from load dispatchers and without need for safety



TRANSFORMERS ARE PLACED IN VACUUM TANK TO REMOVE MOISTURE FROM WINDINGS

How G.E. Builds High-voltage Instrument Transformers for Dependable Operation

DURING FINAL ASSEMBLY, bushings are fitted on base tanks, maintaining uniform pressure. Long-life nitrile rubber gaskets are the result of years of G-E research.

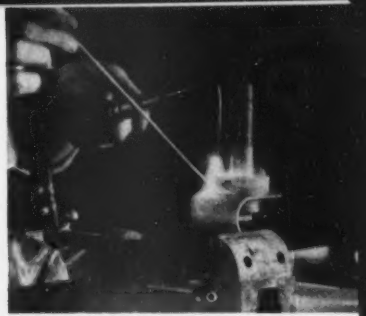
Built for heavy-duty service, General Electric's Type KG current transformers offer both dependable operation and high, sustained accuracy. Each manufacturing operation, each design detail contributes to sturdy construction and long life.

Core and coils are mounted in a shallow tank and coil leads extend up through a heavy insulating barrier into a porcelain housing which acts as a primary bushing.

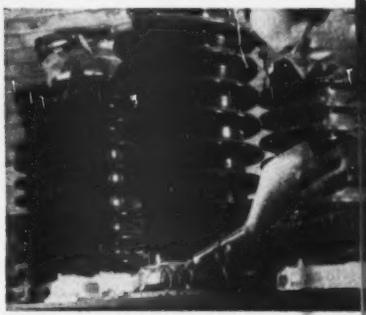
HIGH SUSTAINED ACCURACY

Exclusive features of G-E Spirakore core, for example, assure higher degree of accuracy. Another help: secondary winding is uniformly distributed around core. Transformers are suitable for accurate metering service down to five per cent of the primary current rating and for relay operation up to twenty times full-rated current.

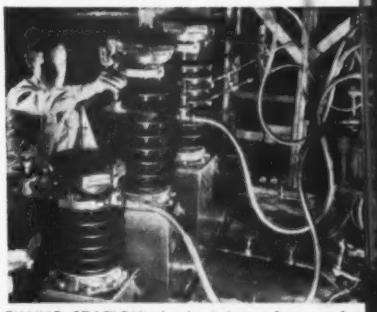
They're available in 25,000- to 69,000-volt ratings. For complete details, see your G-E representative. General Electric, Schenectady 5, New York.



FLEXIBLE LINE TERMINALS are welded to studs. Copper straps connected to studs provide for making series and multiple connections on primary coils without opening transformer.



PORCELAIN BUSHING CEMENTED to top and bottom rings. For greatest strength, cement is steam-oven-cured and wet-process porcelain is straight in design rather than tapered.

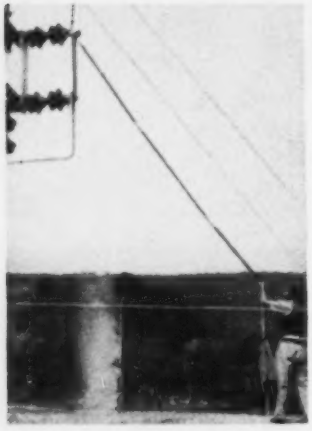


FILLING STATION slowly injects de-aerated oil while a vacuum is held, impregnating the insulation. Previously, tank was partly filled with sand to keep oil expansion to a minimum.

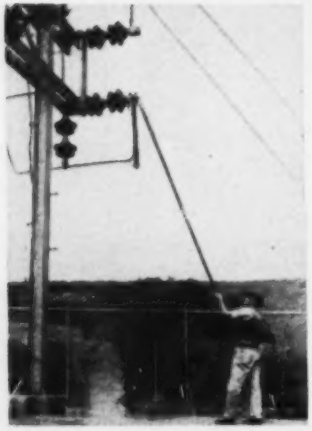
TO ASSURE HIGH ACCURACY, each completed transformer receives rigid ratio and phase-angle tests which prove that it is well within ASA accuracy-standard classification.

GENERAL ELECTRIC

6K-52



OPENING FUSE DISCONNECT with 18-ft sectional stick is first step of fuse removal. Stick shown has three sections. New design has two sections, 12 and 6 ft long

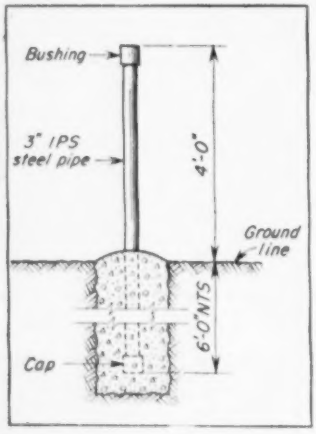


12-FT STICK is used to engage 3-in. pull-out ring during second step of removal. Fuse is lifted out, lowered vertically until bottom of stick touches the ground

STICK END ON GROUND, operator lowers fuse until he can reach it with his hands, disengage it from the stick head. Inserting new fuse is essentially reverse process

grounding procedures needed for structure top mounted fuses. The procedure also reduces cost by simplifying the layout and eliminating elevated platforms and ladders.

Fuses of 66-kv and 115-kv (for 138-kv service) ratings are removed from the ground by using an 18-ft stick with a specially designed head. The stick is made in two sections, the lower 12 ft and the upper 6 ft long. The head of the stick has a straight rod 1¼ in. long with a button on the end for opening or closing the fuse as a disconnect. A T-shaped hook on the opposite side of the head removes the fuse. Pulling rings on the fuse are specified of 3 in. dia to facilitate engaging the switch hook.



The 66-kv fuses are mounted with the center line approximately 17 ft above ground level. This provides 12-ft clearance above ground to the line conductor looped below the fuse, which is 18 in. more than the minimum recommended by the safety code. The maximum weight of fuses used is 19 lb, with a length of 50 in.

Steps for fuse removal are:

1.—Assemble the stick, engage the head in the pulling ring. Unlatch the fuse at the jaw end, swing it to its full open position, disengage the stick from the pull ring.

2.—Remove the 6-ft extension, engage the lifting ring with the 12-ft section.

3.—Lift the fuse from the mounting and lower the stick to the ground, holding it nearly vertical.

4.—Lower upper end of stick until the fuse can be reached and lowered to the ground.

Handling 115-kv fuses used for 138-kv substations is similar, with special provisions. The fuses are mounted with centers about 22 ft above ground. Two switch sticks are used. The 18-ft stick opens the fuse, as described before. A special 16 ft 6 in. stick lowers the fuse to the operator's reach. Since the stick must be lowered in a vertical position, a pipe guide (sketch) is located directly below the fuse to permit lowering the bottom of the stick 6 ft below ground so the operator can remove the fuse from the stick with his hands.

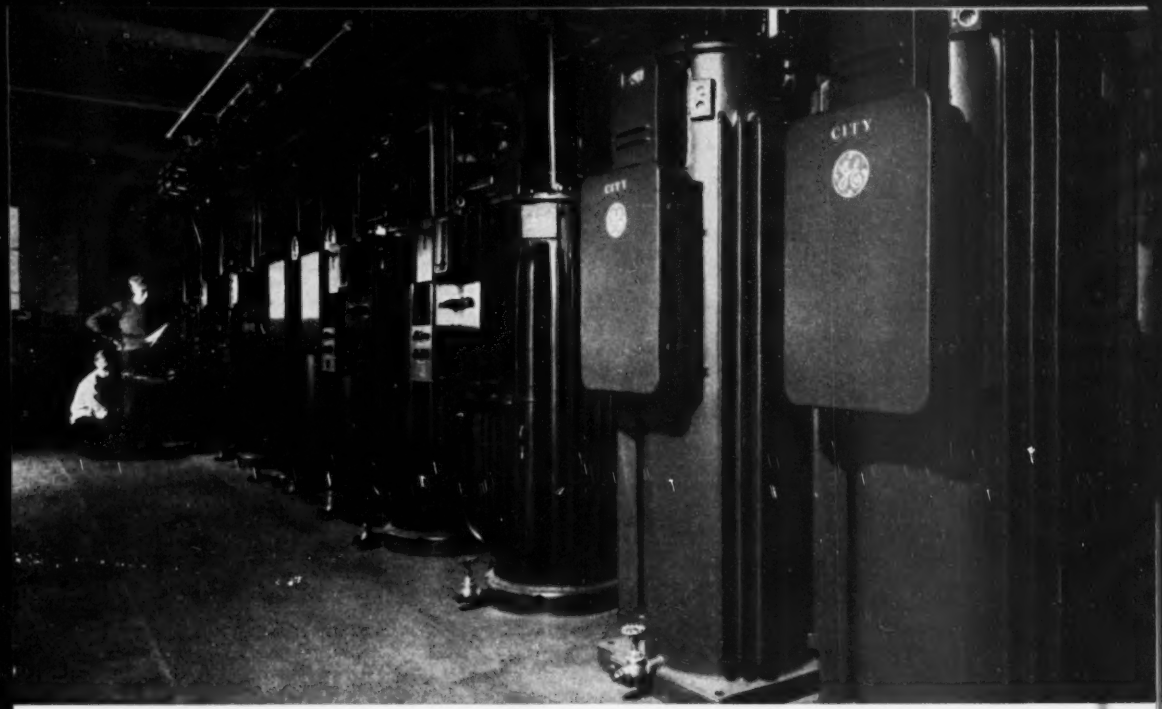
*Seven Standard Substations Fit System Needs From 4 to 220 kv., W. B. Morton and L. L. Nonemaker, Electrical World, April 7, 1952

Portable Work-Bench Aids Field Maintenance of Reclosers

G. E. HILL, Jr, Substation Maintenance, Appalachian Electric Power Co, Buefield, West Virginia

A portable, folding work-bench is used to advantage in outdoor field maintenance of oil circuit reclosers. Inspection and repairs are expedited by the bench-top opening which permits the exposed recloser to be mounted upside down so all parts are readily accessible. The porcelain terminals extend below in a protected position.

Procedure followed for maintaining reclosers involves these operations:



Highest quality regulation provided by 12 IRS regulators of Western Mass. Elec. Co. maintains consumer goodwill. Passing years have brought important design improvements, but even oldest units continue to provide accurate stepless regulation.

Utility Gets 21 Years of Top-notch Service From G-E Induction Voltage Regulators

Outstanding Over-all Performance. J. L. (Joe) Hyland, Supervisor of Stations, Northern Division, is thoroughly pleased with the ease of adjustment and low maintenance of IRS regulators.

Consumers get faster, closer voltage correction . . . utility reaps added benefits of reduced maintenance

J. L. (Joe) Hyland, Supervisor of Stations, Northern Division of the Western Massachusetts Electric Company, reports that the Company installed its first four G-E Type IRS single-phase induction voltage regulators at its Greenfield Substation back in 1931.

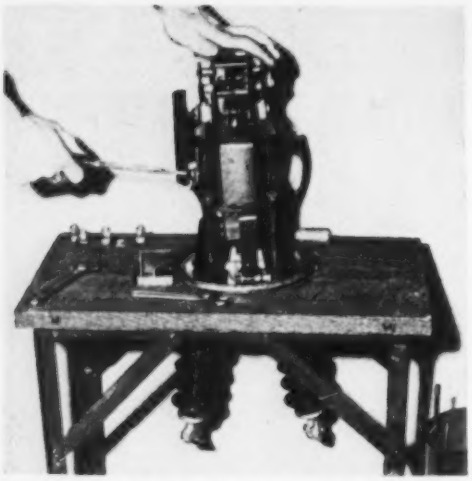
Their over-all performance and ease of adjustment so impressed company officials that they have added only G-E induction regulators at the substation since. Twelve have been installed to date—and they have been in operation almost continuously.

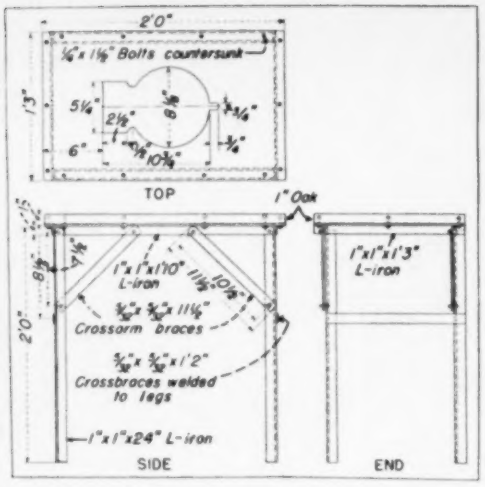
Protect consumer goodwill. The ability of these regulators to respond immediately to voltage changes and the resulting close regulation assure the type of service that protects valuable consumer goodwill.

They require less maintenance. Because of the rugged simplicity of the IRS design, these regulators have needed little maintenance. There are only three moving parts, which are mounted on enduring roller or ball bearings and coupled through double worm gearing. On the units built since 1940, no lubrication is necessary because the complete mechanism (including the motor) is immersed in oil.

For more information on the performance of IRS regulators, ask your G-E Apparatus Sales representative for Bulletin GEA-2985. Or write *General Electric Company, Schenectady 5, New York.* 404-54

GENERAL ELECTRIC





FIXING RECLOSERS in the field is greatly helped by folding work-bench. Construction details are shown in sketch

(1) Removing the reclosers from the pole, (2) removing the oil, (3) dismantling the unit, (4) inspecting contacts and coils, (5) making necessary adjustments or repairs, (6) washing and cleaning, (7) installing new oil, (8) reassembling, (9) testing, and (10) restoring the units to service.

The bench illustrated was designed to mount one kind of recloser. But the hole could be designed to fit other reclosers. The top is made of 1-in. oak and is supported on angle iron frame. The legs are angle-iron and can be folded under the top for compact storage or transportation.

Field maintenance has been made practical by using the work-bench and scheduling the work for only fair weather. If rain threatens, the field maintenance is postponed so that protection against the weather will not be required. However, if a recloser has been taken down and opened, and unexpected rain threatens, the unit is covered with a tarpaulin until maintenance can be continued in fair weather. During field maintenance of reclosers, temporary circuit protection may be provided.

Reclosing Sectionalizers: How They Work

Data are presented on operating experience with oil reclosers and both open- and enclosed-type fused reclosing devices based on questionnaire replies by 12 member companies of the Pennsylvania Electric Association.

Accompanying tables show the trend in number of units in service. Difference between totals in service and totals in operation is due to not all operating records being available at time of filling in the questionnaires.

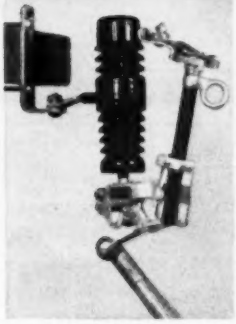
Oil recloser usage continued to show an increase—1,554 units in 1951 compared to 1,314 units in 1950. But this increase of 18.3% is materially less than for former years when it ranged from a high of 80.6% in 1947 to a low of 39.5% in 1949. For the first time since records have been provided, two companies report a decrease in reclosers in service over the previous year. Rate of faulty operations per 100 units in service is 2.1 in 1951;

Composite Summary of Automatic Reclosing Line Devices for 1945-1951

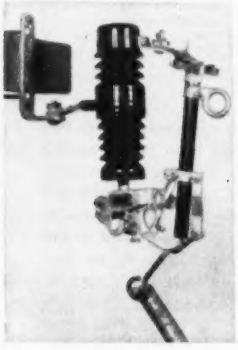
	'45	'46	'47	'48	'49	'50	'51
Oil Reclosers							
Companies Reporting	5	6	6	9	10	9	10
Units in Service	125	211	381	574	801	1,314	1,554
Total Operations	1,63	2,078	4,800	6,418	5,754	9,275	10,928
Total Operations Per Unit in Service	13.0	9.8	12.6	11.2	7.2	7.1	7.0
Faulty Operations	3	3	6	18	8	29	32
Faulty Operations per 100 Units in Service	2.4	1.4	1.6	3.1	1.0	2.2	2.1
% Increase in Total Number in Service over Previous Year	....	68.8	80.6	50.7	39.5	64.0	18.3
Open-Type Reclosing Devices							
Companies Reporting	6	8	6	7	7	7	8
Units in Service	476	695	616	808	623	633	488*
Total Operations	274	289	420	325	260	181	121
Total Operations per Unit in Service	0.58	0.42	0.68	0.40	0.42	0.29	0.25
Faulty Operations	19	27	29	23	13	21	8
Faulty Operations per 100 Units in Service	4.0	3.9	4.7	2.8	2.1	3.3	1.6
% Increase in Total Number in Service over Previous Year	....	46.0	−11.4	31.2	−22.9	1.6	−22.9
Enclosed-Type Reclosing Devices							
Companies Reporting	5	6	4	5	4	4	4
Units in Service	156	184	142	99	122	172	147
Total Operations	56	49	41	47	45	92	61
Total Operations per Unit in Service	0.36	0.27	0.29	0.47	0.37	0.53	0.42
Faulty Operations	9	4	0	4	1	3	6
Faulty Operations per 100 Units in Service	5.8	2.2	0	4.0	0.8	1.7	4.1
% Increase in Total Number in Service over Previous Year	.....	17.9	−22.8	−30.3	23.2	41.0	−14.5
Total All Units in Service	**757**	**1090**	**1139**	**1481**	**1546**	**2119**	**2189**

* Does not includedevices where operating records are not available.

1 Fuseholder assembly showing how fuse-link cable passes over lever arm of load-break device.

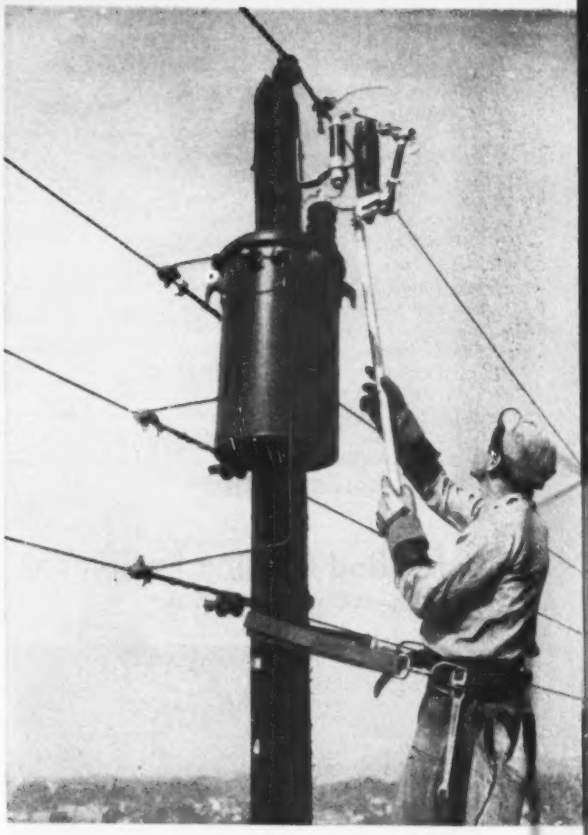


2 Downward pull on switchstick inserted in hook-eye breaks fusible element of fuse link.



3 When fuse link breaks, the cutout interrupts load current as it would interrupt a low fault current.

4 After current interruption, fuseholder drops open removing itself from the circuit.



New G-E Load-break Cutout provides easy low-cost load switching . . . sectionalizing

Liberal design of G-E cutouts permits simple load-break device

General Electric's Open Dropout Fuse Cutouts—7.8 kv and 15 kv, 100-ampere ratings—now feature an optional load-break device. With it, you can switch loads or sectionalize your distribution circuits with but little increase in your cutout investment.

Fast, safer switching. The new load-break device operates by breaking the fusible element of the fuse link *with arc-interruption occurring inside the fuseholder tube.* It provides fast, safer switching of either inductive or capacitive load currents up to the 100-ampere continuous rating of the cutout. By substituting load-break fuseholders for conventional fuseholders—both 2000-ampere and 5000-ampere ratings—cutouts already in service are converted to load-break operation.

Liberal design of G-E cutouts for full-range current interruption makes them ideal for breaking load currents. It also permits an extremely simple load-break device that consists only of a stainless steel lever arm coupled to the cutout fuseholder. The load-break device has no awkward protrusions or parts to stick, bind or otherwise interfere with the dropout action of the cutout. And it does not interfere with fusing or inserting and removing the fuseholder by switchstick.

For more information on this, and other cutouts, write to *General Electric Company, Schenectady 5, New York.*

406-45

G-E OPEN DROPOUT FUSE CUTOUTS OFFER YOU MANY UNIQUE "EXTRAS"

- "Birdproof construction" eliminates unnecessary fuse blowing.
- Close coupling of fuseholder to insulator, plus shock absorbers, reduces recoil stresses.
- Sealed upper end on fuseholder excludes water and controls expulsion gases.
- "Hinge guides" eliminate side-sway, provide positive contact engagement.
- Interchangeable standard and heavy-duty fuseholders—2000-amp. and 5000-amp. interrupting ratings.

GENERAL ELECTRIC

high was 3.1 in 1948 and low was 1.0 in 1949.

Open-type and enclosed-type fused reclosing units' usage declined 22.9% and 14.5% respectively over the previous year. Faulty operations of open-type devices declined for 1951 with a rate of 1.6 per 100 units in service. This is the lowest failure rate for any year during the seven years of records. The rate has ranged from a high of 4.7 in 1947 to a low of 2.1 in 1949. For enclosed-type devices the faulty operations were 4.1 per 100 units in 1951 compared to only 1.7 in 1950 and 0.8 in 1949. However faulty operations were 5.8 in 1945, the first year of records, and 4.0 in 1948.

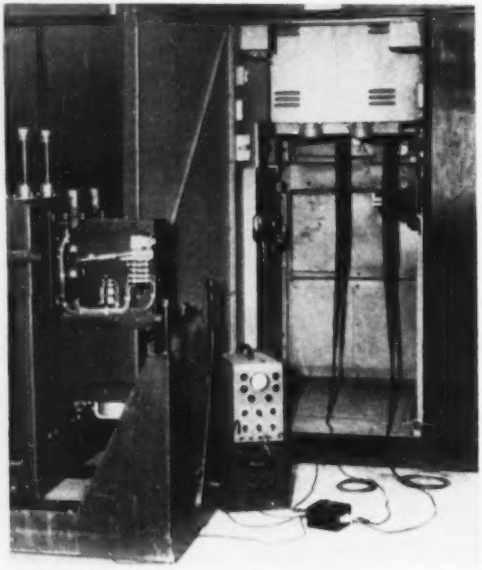
Trend in Number of Automatic Reclosing Line Devices in Service

Company	Oil Reclosers					Open-type Devices					Enclosed-type Devices				
	'47	'48	'49	'50	'51	'47	'48	'49	'50	'51	'47	'48	'49	'50	'51
A	Z	Z	11	20	11	Z	Z	O	16	17	Z	Z	—	O	O
B	19	64	75	145	189	5	2	2	2	3	28	43	52	85	69
C	—	—	26	30	72	—	—	3	6	6	81	21	49	67	63
D	Z	6	28	307	272	Z	—	O	O	O	Z	—	—	O	O
E	71	84	87	112	149	—	—	O	N	N	—	—	O	N	N
F	—	—	—	O	O	95	240	259	274	281	—	—	—	N	N
G	21	21	22	32	37	39	30	7	9	9	12	12	12	9	9
H	—	—	O	O	O	—	—	O	O	O	—	10	O	O	O
I	155	193	255	288	362	—	—	N	N	N	—	—	N	N	N
J	6	22	51	129	191	120	120	30	30	33	—	—	—	O	O
K	109	171	231	251	271	267	305	313	296	139	21	13	9	11	6
L	—	—	—	—	40	—	—	—	—	57	—	—	—	—	O
Total	381	561	786	1314	1594	526	697	614	633	545	142	99	123	178	147

O = Reporting that no units were in service — = Nothing reported or no comment
N = Reporting records not available Z = No reply received

Simplified Phasing Equipment

M. J. McGONEGLE, Tullahoma, Tennessee*



PHASING METALCLAD SWITCHGEAR is done with cathode ray oscilloscope, test probes, and phase-shift box

A conventional three-in cathode-ray oscilloscope, two probes, and a small phase-shifter box is all that is needed to accurately measure the phase displacement between any two high voltage ac potentials, or to determine the phase rotation of a three-phase source, or to measure the voltages. This equipment can be easily carried to the testing site. There is no metallic connection to the terminals under test which insures a minimum hazard to personnel and the system under test.

With specially designed probes, it is practical to bring a true sample of a high potential (distribution and transmission magnitudes) safely to the oscilloscope. By placing one probe on a conductor of the incoming line and the other probe on the running bus, the scope will immediately show the relation between the two sources. Changing the probes to the other two phases one at a time gives a complete check. This method is practical on delta, wye, ungrounded or grounded systems. It is not necessary to tie one corner of a floating delta down. Each of the six voltages to ground can quickly be measured in making a three phase test on each of the two sources. The actual effective ground point in relation to the three line voltages is established.

The phase-shift box is used to determine the phase rotation of the three phase ac conductors of a particular source. The two probes are placed on any two of the conductors, such as A and B. The scope will show 120 degrees displacement. Conductor A potential is then retarded by the phase shifter. If the scope shows less than 120 degrees displacement, conductor A is leading conductor B and the rotation is A B C.

* Formerly associated with Toledo Edison Co

First Basal Spray Gives 90% Kill

LEON A. PHILLIPS, Asst to Supt of Lines & Substations, Pennsylvania Power & Light Co, Hazleton, Pa.

Pennsylvania Electric Association member companies treated chemically more than 15,000 acres of brush and woodland in 1949 and 1950, to keep under control objectionable growth on rights of way near transmission and distribution lines and communications circuits. Such control is desirable at the lowest recurring annual cost, and herbicides with their lower initial cost and high degree of effectiveness have

(*Continued on page* 126)

Rome-Turney water-cooled condenser coil. Tube is ⅜" O.D., .042" ga., bent on a 1⅜" centerline diameter. Soldered helical fins are .135" wide, spaced 14 turns to the inch. Other types of heat exchanger coils are also shown. Rome-Turney forms coils out of tube up to 40 feet long, without joints.

For Copper Tube that can be BENT

Rome-Turney sees REVERE

Most of the Revere Metals are fabricated by usual methods into conventional products. Some of them, however, appear on the market in forms that are unusual and possess special advantages. Take these helical-finned copper coils produced by the Rome-Turney Radiator Co., Rome, N. Y. It takes extra skill to produce coils with such small radii. The company can produce the coils shown on a commercial basis, for use in air conditioning apparatus, air compressors, and general heating and cooling applications where compactness plus high heat transfer rates are essential.

How it is possible to make such tight turns is Rome-Turney's secret. Revere does not share in it, nor does Revere want to reveal a secret of its own, which is how we turn out copper tube in a special bending temper for an application such as this. All we can say is that the two methods dovetail very nicely. If you need copper tube that can be bent easily, and offers you as well the advantages of corrosion resistance, high heat transfer, easy joinings, see Revere. We also make copper pipe, tube in copper alloys, aluminum alloys, and electric welded steel tube. If required, the Technical Advisory Service will gladly collaborate with you, as it has with Rome-Turney, on selection and specification matters. Get in touch with the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

LET'S BRING IT OUT IN THE OPEN...

The BIG QUESTION is "Are Preformed Armor Rods the most efficient and economical answer for conductors 4/0 and larger?" Practically every Utility Engineer and Contractor recognizes the merits of Preformed Armor Rods for the smaller conductors, but in some minds, there has been a question or two regarding their application on the larger ones.

However, for British Columbia Electric Company Limited (see opposite page), there is no question. They are using Preformed Armor Rods on their new 795,000-cir mil ACSR conductors. And one Utility after another in this Country is adopting them because of their exclusive and outstanding advantages. Below are listed some Users of "large-size" Preformed Armor Rods.

For details on your specific application, write or telephone Cleveland: EXpress 1-3571.

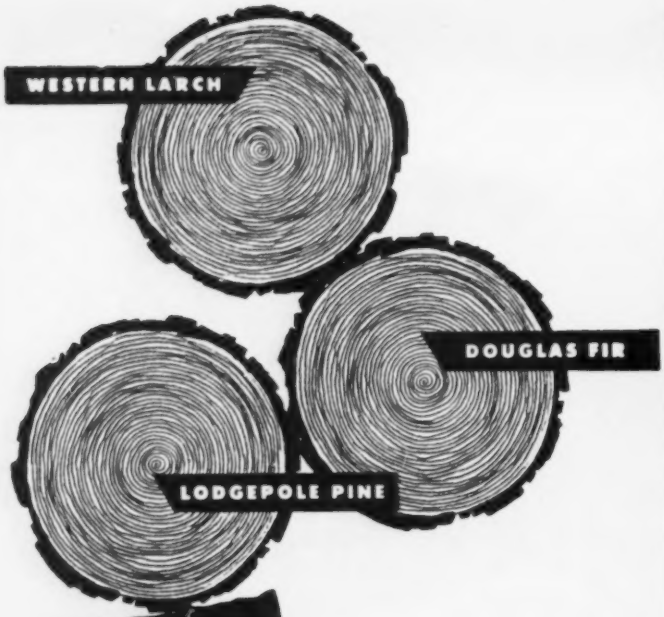
USER	SIZE ACSR CONDUCTOR	USER	SIZE ACSR CONDUCTOR
Boston Edison Co.	795,000 Cir Mils	New England Power Co.	795,000 Cir Mils
California Electric Power Co.	4/0	New Jersey Power & Light Co.	556,500 Cir Mils
California Oregon Power Co.	795,000 Cir Mils	New York State Elec. & Gas Corp.	636,000 Cir Mils
California-Pacific Utilities Co.	4/0	Niagara Mohawk Power Corp.	336,400 Cir Mils
Central Maine Power Co.	266,800 Cir Mils	Northern States Power Co.	336,400 Cir Mils
Central Power & Light Co.	4/0	Ohio Edison Co.	795,000 Cir Mils
Cincinnati Gas & Electric Co.	4/0	Ohio Power Co.	477,000 Cir Mils
Cleveland Electric Illuminating Co.	795,000 Cir Mils	Oklahoma Gas & Electric Co.	477,000 Cir Mils
Consumers Power Co.	266,800 Cir Mils	Otter Tail Power Co.	266,800 Cir Mils
Detroit Edison Co.	795,000 Cir Mils	Pacific Power & Light	397,500 Cir Mils
Georgia Power Co.	4/0	Pennsylvania Electric Co.	1,033,500 Cir Mils
Gulf States Utilities Co.	336,400 Cir Mils	Portland General Electric Co.	795,000 Cir Mils
Idaho Power Co.	397,500 Cir Mils	Potomac Edison Co.	556,500 Cir Mils
Illinois Northern Utilities Co.	477,000 Cir Mils	Public Service Co. of Indiana, Inc.	477,000 Cir Mils
Indiana & Michigan Electric Co.	556,500 Cir Mils	Rochester Gas & Electric Co.	336,400 Cir Mils
Indianapolis Power & Light Co.	954,000 Cir Mils	St. Joseph Light & Power Co.	4/0
Iowa Power & Light Co.	4/0	Sacramento Municipal Utility Dist.	4/0
Kansas City Power & Light Co.	556,500 Cir Mils	San Antonio Public Service Board	336,400 Cir Mils
Kansas Gas & Electric Co.	477,000 Cir Mils	Sierra Pacific Power Co.	4/0
Kansas Power & Light Co.	266,800 Cir Mils	Southwestern Public Service Co.	397,500 Cir Mils
Los Angeles Dept. of Water & Power	954,000 Cir Mils	Tennessee Valley Authority	397,500 Cir Mils
Louisville Gas & Electric Co.	795,000 Cir Mils	Union Electric Co. of Missouri	795,000 Cir Mils
Lowell Electric Light Corp.	795,000 Cir Mils	Utah Power & Light Co.	397,500 Cir Mils
Metropolitan Edison Co.	556,500 Cir Mils	Virginia Electric & Power Co.	477,000 Cir Mils
Minnesota Power & Light Co.	4/0	Washington Water Power Co.	795,000 Cir Mils
Mississippi Power & Light Co.	4/0	West Penn Power Co.	556,500 Cir Mils
Missouri Public Service Corp.	4/0	Western Light & Tel. Co.	266,800 Cir Mils
Monongehela Power Co.	556,500 Cir Mils	Western Massachusetts Elec. Co.	336,400 Cir Mils
Montana Power Co.	336,400 Cir Mils	Wisconsin Public Service Corp.	266,800 Cir Mils

British Columbia Electric Company Limited, in pioneering their 345-kv transmission line, has most modern installation in the Western Hemisphere. PREFORMED ARMOR RODS will protect the initial single conductor at the support points as well as the dual conductors, illustrated above, which are planned for ultimate installation.

Shown in the picture are, left to right: J. P. Fraser, assistant chief engineer, electrical division; F. O. Wollaston, superintendent of design, engineering division; T. Ingledow, vice-president and chief engineer; J. H. Steede, executive assistant to vice-president and chief engineer; H. W. Smith, assistant chief engineer, engineering division.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO



THE Big 3 IN WESTERN POLES

- produced
- treated
- sold by...

J. Neils Lumber Company

Look to the West for transmission and telephone poles... To western Montana, where much of America's finest virgin timber is located...To the J. Neils Lumber Company plant at Libby.

Long a quality manufacturer of forest products (since 1895) J. Neils is a major producer of power and telephone poles.

At Libby, Montana, in the heart of a great forest empire, J. Neils manufactures and treats the poles that come from magnificent stands of Western Larch, Lodgepole Pine and Douglas Fir. This modern pole treating plant measures up to the highest quality standards in men, materials, equipment and methods.

An illustrated folder on J. Neils treated poles, and information regarding their application to your requirements, will be furnished gladly on request.

J N

J. Neils Lumber Company

Pole Division: LIBBY, MONTANA

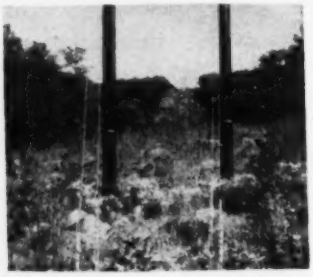
Basal Spray

(*Continued from page* 122)

proved more economical than cutting brush by hand or power equipment.

Depending on local factors, as much as 300 gal per acre of Ammate solution must be used, costing nearly $100 per acre. Ammate is effective in controlling mixed species of brush and

BEFORE TREATMENT AND . . .

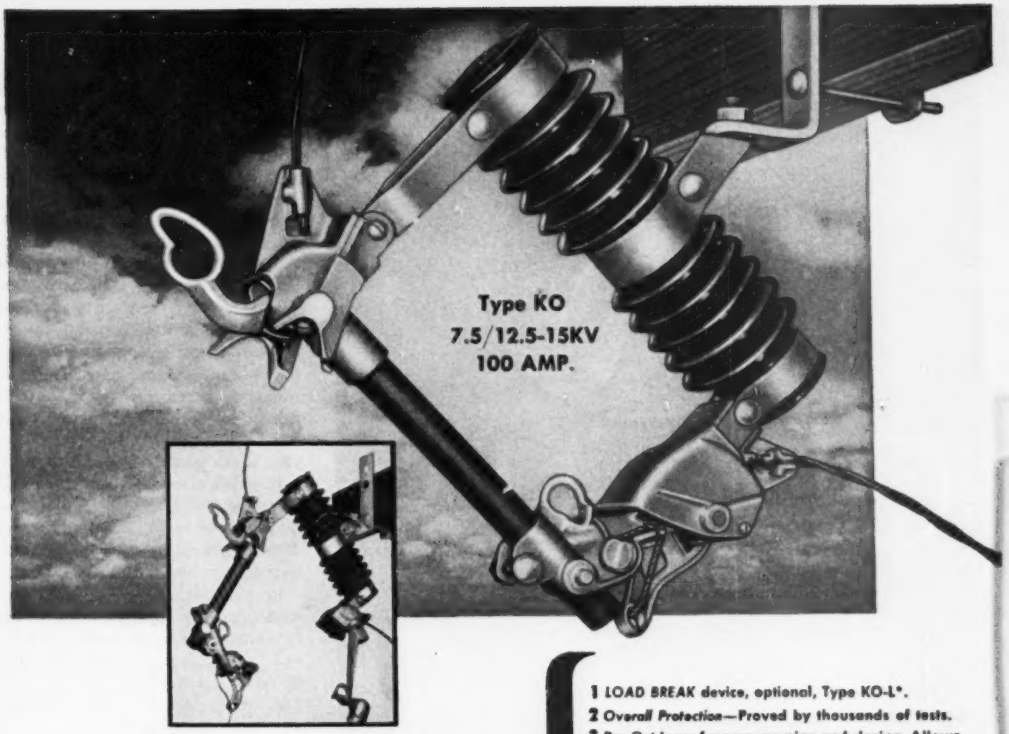


AFTER ONE YEAR, right-of-way shows 90% kill of oak, red maple, sumac, sassafras, wild cherry, hickory, ash, and briars. Three lb 2,4D and three lb 2,4,5T per 100 gal fuel oil were used as a basal spray

best results are obtained by applying under high pressure to the entire foliage, when the plants are in full leaf.

2,4D and 2,4,5T mixed with water has an average applied cost of $30-40 per acre, and is only effective during the foliage season. It is very effective against aspen, birch, cherry, chokecherry, elm, grape, locust, sassafras, sumac, sycamore, Virginia creeper and walnut.

2,4D and 2,4,5T mixed with oil is not effective when sprayed over the entire plant, since the oil kills the foliage on contact and often only partial stem kill results. This mixture applied to the base of plants is most effective for the greatest number of species, including such resistant types as red maple, oak, ash and hickory. The



*Type KO-L, with Load Break

Only CHANCE KO gives you all these features

There's a big difference in cutouts! *Overall protection* throughout the entire interruption range—all-weather operation—positive fuse coordination—low radio noise level . . . are just a few important things to look for when choosing *your* cutouts.

Compare the CHANCE KO with any other cutout. Compare it electrically. Compare it mechanically. Test it from maximum rated interruption to your lowest currents . . . you'll find that the CHANCE KO gives top performance because the KO is the basic design for the type KO-L—which is built for load break operation.

Order through your regular supplier—specify CHANCE KO or KO-L.

1 **LOAD BREAK** device, optional, Type KO-L*.
2 ***Overall Protection*—Proved by thousands of tests.**
3 ***Pry-Out Lever* for easy opening and closing. Allows the use of heavy duty contact springs without requiring extra effort to remove tube.**
4 ***Exclusive Ejector Mechanism* provides fast complete ejection of fuse link before contacts part—even on a low current interruption.**
5 ***Sleet Shields for All-weather Operation.* Protect contacts and operating mechanism and prevent water from entering the tube to cause twisting and swelling of the fiber.**
6 ***Mechanical Time-Delayed Contact Separation.* Prevents pitting or burning of contacts.**
7 ***Pivot Bracket* (E.E.I.—NEMA) for cross-arm mounting. A special bracket is available for pole mounting.**
8 ***Positive Semaphore Indication* to show if cutout was opened manually or by a protective operation.**
9 ***Easy Reloading*—simple hook stick operation from any angle.**
10 ***Link Element Protection*—Link tension not affected by closing action. Eliminates breakage or damage to time-current characteristics of link.**
11 ***Overtravel Stops*—Protect pressure contact springs.**
12 ***Safety to Operator*—Tube angle directs expulsion gases away from lineman when operating cutout.**

You know it's RIGHT when you specify CHANCE

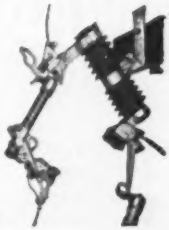
ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

* Chance Type KO-L gives load break operation with full interrupting capacity. It's not just a cutout with a load break attachment—it's *built to break loads.* This load break costs only $2.00 extra! Get full information today.



C52-11

THE MARK OF

MARCUS MTC

QUALITY

...al formula for the latter remains unchanged. The combination of a good product with genuine interest in the customers' side of the transaction has necessitated the completion of our third and largest expansion move within the past 5 years. What better recognition of the *"Mark of Quality"!*

•

Representatives in Principal Cities

General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase.

450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 ∅— 120/208Y, 4 wire.

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

MARCUS DRY TYPE transformers

NEMA

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY.

1 to 3,000 KVA up to 15,000 Volts to meet Individual Requirements

• DISTRIBUTION • GENERAL PURPOSE • UNIT SUBSTATION • PHASE CHANGING • ELECTRIC FURNACE • RECTIFIER • WELDING • MOTOR STARTING • SPECIAL

MARCUS TRANSFORMER CO., Inc.

32-34 MONTGOMERY ST. • HILLSIDE 5, NEW JERSEY

average applied cost is about twice that of the water mixture.

Some companies plan a once or twice treatment with a water solution to eliminate the "easier-to-kill" species, followed by a spot basal spray with an oil mixture to the "harder-to-kill" species. This seems more economical than other methods because the more expensive oil mixture is applied to fewer plants and the brush has been thinned making the right of way more accessible. However, the greater effectiveness of the oil mixture might prove it more economical because of the decreased number of applications.

Personnel and equipment load factors enter because the water mixture is effective only during foliage, while a basal oil application gives good results at any season. The pictures show a 90% kill after one year with a 3 lb 2,4D and 3 lb 2,4,5T per 100 gal fuel oil as a basal spray. Species consisted of oak, red maple, sumac, sassafras, wild cherry, hickory, ash and briars.

Some investigations are being conducted to determine the effectiveness of a mixture of water and oil for 2,4D and 2,4,5T. At least one manufacturer has proposed the application of 2,4D followed by Ammate. Some combination may prove most effective.

Tree stumps one inch and greater are most effectively treated with 8-16 lb 2,4,5T in 100 gal oil, to prevent resurgent growth. Satisfactory results can be obtained from 16-32 lb mixed 2,4D and 2,4,5T. Using either a knapsack sprayer or power equipment, the sides and top of the stump as well as the exposed roots should be wetted to run-off. Stumps may be treated during any season and optimum results obtain immediately after cutting.

Herbicides have proven to be nonpoisonous to humans, live stock, wild life and fish, in the concentrations used. As to the use of herbicides near highways, two states have forbidden this, while the Pennsylvania State Highway Department has instituted rules which include the following:

1 Before spraying, saplings over 8 ft. must be cut down and removed.

2 Spraying desirable vegetation not a hazard to the operation of utility lines is prohibited.

3 To lessen public criticism, spraying shall be done as much as possible between August 15 and April 15.

It can be definitely stated that herbicides are more effective and more eco-

(*Continued on page* 133)

HI-TENSION NEWS *Junior*

'til ether replaces aluminum

High-frequency wireless transmission of electric power may be the coming thing, but, for now, there is no better way to build transmission lines than with O-B suspension insulators.

Power company records show that many of the 30-odd million O-B insulators now in service have performed excellently for over thirty years even under adverse conditions. Build your next line with O-B suspension insulators. You'll find that they'll be rugged and dependable -- and that they'll probably last until ether replaces aluminum.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

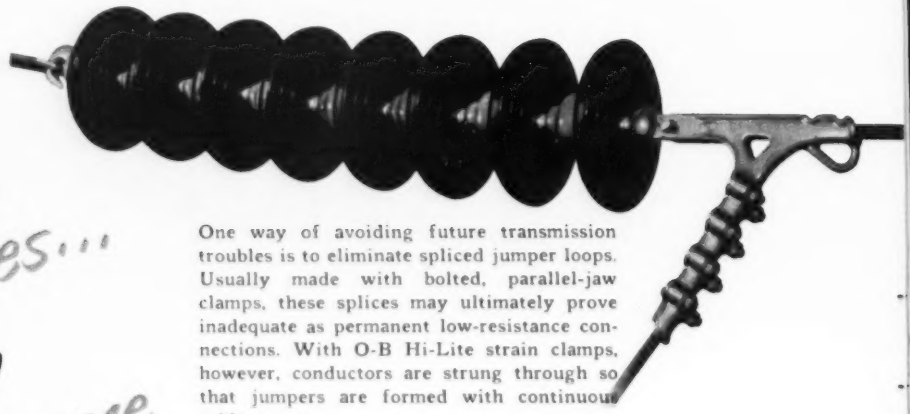
OB

HI-TENSION NEWS *Junior*

HOW LONG Will These Station Insulators Last?

This is certainly a fair question, but we're not sure of the answer. Many O-B station insulators have been in service nearly 40 years -- with no end in sight. Actually, not enough service years have elapsed to gage fairly the life expectancy of these units.

Today, most station insulator designs are based on certain recommended Standards. New, these units don't look too different, but looks or Standards can't say how long they'll last. Based on past O-B performance, however, you can be sure of getting a uniform, more rugged insulator -- one that has been built to last the life of your system -- and better. Rely on 40-year dependability. Rely on O-B station insulators.



No Splices... No Maintenance

One way of avoiding future transmission troubles is to eliminate spliced jumper loops. Usually made with bolted, parallel-jaw clamps, these splices may ultimately prove inadequate as permanent low-resistance connections. With O-B Hi-Lite strain clamps, however, conductors are strung through so that jumpers are formed with continuous cable.

Inherently low in cost, these clamps not only mean a maintenance savings to you in the future, but also the simplified construction they permit spells savings in time and materials -- right now. Standardize on O-B Hi-Lite strain clamps.

At every voltage step from 13.2 to 69 kv, O-B offers you a free choice between a conventional pintype and a line post insulator. This complete freedom of choice means somewhat more to you than mere buying convenience. Let's look at it from a practical standpoint. O-B could not live with two lines of products where one was outstandingly better than the other -- or there wouldn't be two lines in a few years. Both the pintype and post have certain special advantages, and it is only good commercial sense to keep them in reasonable balance. Hence, each has a good influence on the quality of the other, in the hands of a conscientious manufacturer. It's a form of competition within the company that has only one logical result -- a better product whichever you choose. Keep this in mind when you specify insulation for new lines.

Stop cable slip
with O·B CLAMPTOPS

You can easily eliminate damaging conductor slippage by using O-B Clamptop insulators. A simple mechanical jaw grips the cable firmly and without slip, and will develop the full strength of the average crossarm. Furthermore, Clamptop insulators permit much safer and quicker hot stick operations.

Inherently radio-quiet, these insulators will remedy many difficult interference problems. Install O-B Clamptop insulators on a trial basis, and you'll soon have them at the top of your list of preferences.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

MATCH *Today's* INSULATION WITH *Tomorrow's* LOADS

During the past 13 years, urban residential power consumption has increased 350 per cent -- and it's still going up. To translate in terms of distribution voltages, 2300 volts may have been adequate yesterday, 4000 volts may be adequate today, but in all probability, 15,000 volts will be needed tomorrow.

By installing two six-inch suspension insulators at dead-end points, you will be ready for this inevitable voltage increase. You will be avoiding the extra time and expense of adding the second insulator later, adjusting for resultant cable sag, and you will enjoy a higher safety factor during the period of load growth.

Begin using two O-B six-inch suspension insulators for your primary deadends now. By doing this, you can match today's insulation with tomorrow's loads.

Distributed by GraybaR ELECTRIC COMPANY

GraybaR QUALITY Since 1891 · REG U.S. PAT. OFF.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4239-I

Basal Spray

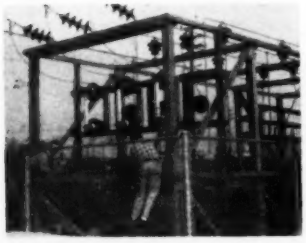
(*Continued from page* 128)

nomical than hand-cutting. However, further development and data are necessary to attain maximum productivity under various conditions.

Ladder for Street Lights

G. E. LARASON, Oklahoma Gas & Electric Co, Oklahoma City

Special ladders and ladder racks for pick-up trucks have made available to local offices in small communities facilities for changing street lights without tieing up a truck for that purpose alone. A standard 22-ft ladder with 9-ft extension is mounted on a special rack. The ladder can be put on the truck when required and taken off when it is not in use and the truck is needed for other work.



Substations Made of Wood

Simple wood structures are used for industrial substations by Los Angeles Dept of Water and Power in plants whose activity is of a temporary nature. Wood members are also used when steel is unavailable.

Add DBPC

to your transformer oils . . .

to guard against sludge

• DBPC (Di-tert-butyl-para-cresol), added to transformer insulating oils, minimizes the development of sludge deposits, such as illustrated. DBPC slows down the rate of oxidation, retards sludge formation, adds extra life to the insulating oil, and promotes more efficient transformer operation.

Under accelerated oxidation tests, oil inhibited with only 0.3% DBPC has proved that it can outlast untreated oils by 14 times. The saving with DBPC is obvious.

In addition to its use as an oxidation inhibitor for transformers, DBPC can also be used in circuit breaker oils. Used here it does not affect arcing time, rate of gas generation, carbon formation or dielectric change.

DBPC is available in a white-to-yellow crystal that is readily soluble in oil and which can be added to either new or reclaimed oil. Or it can be purchased in a compounded oil solution under the Koppers trade name Impruvol 20. Specify DBPC inhibited oil to your transfomer manufacturer or your oil supplier. Or order DBPC directly from Koppers.

KOPPERS

KOPPERS COMPANY, INC.

Chemical Division, Dept. EW-112, Pittsburgh 19, Pa.

Compensator Settings For Regulators in Open Delta

W. C. SEALEY, Transformer Section, Allis Chalmers Mfg Co, Milwaukee, Wis.

When two single-phase regulators are connected in open delta to regulate voltage of a three-phase line serving a 100% power factor load, current in the line of one regulator lags the voltage across its potential transformer by 30 deg. Current in the regulator line of the other leads the voltage across the potential transformer by 30 deg.

If resistance and reactance settings for the line drop compensator are made proportional to line resistance and reactance, desired compensation for line drop will not be secured because of this phase difference.

One solution is to set resistance and reactance values of line drop compensators with calculated values which take care of phase shift, instead of with actual line resistance and reactance. For instance, if we let R and X = line resistance and reactance drop, respectively; and R1 and X1 = resistance and reactance compensator settings of lagging regulator, respectively; and R2 and X2 = resistance and reactance compensator settings of leading regulator; then:

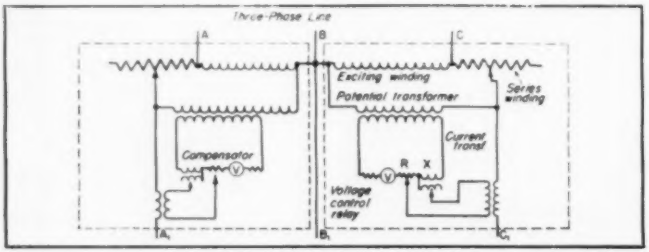
$$R1 = 0.866\ R - 0.5X$$
$$X1 = 0.5R + 0.866X$$
$$R2 = 0.866R + 0.5X$$
$$X2 = 0.866X - 0.5R$$

However, use of data in the table will allow required compensator settings to be selected without calculations for each case. For example, to compensate for a line reactance drop of 10 v and a line resistance drop of 8 v, these settings should be used:

$$R1 = 2 \qquad R2 = 12$$
$$X1 = 13 \qquad X2 = 5$$

For negative values of R1 or X2, the portion of the circuit containing the negative voltage drop must be reversed. If the resistance portion and the reactance portion of the compensator are supplied by its own current transformer, reversal can be accomplished by transposing the associated current transformer leads.

If the accompanying circuit is used, reactance compensator is reversed by transposing the leads of the untapped winding of the reactor X. Negative resistance compensation is accomplished by reversing the current transformer secondary leads and by reversing the leads of the untapped winding of the reactance compensator.



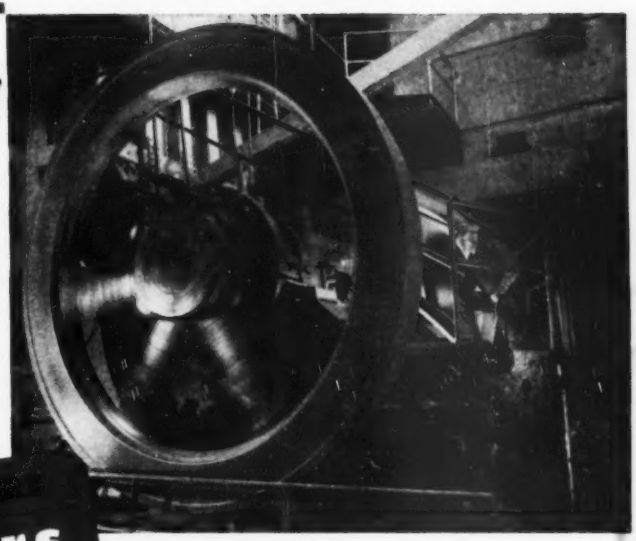
LINE REACTANCE (X)

LINE RESISTANCE (R)		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	R1	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8	-8	-9	-9	-10	-10	-11	-11	-12	-12
	X1	0	1	2	3	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	16	17	18	19	20	21
	R2	0	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	
	X2	0	1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	16	17	18	19	20	21	
1	R1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8	-8	-9	-9	-10	-10	-11	-11
	X1	1	1	2	3	4	5	6	7	7	8	9	10	11	12	13	13	14	15	16	17	18	19	20	20	21
	R2	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13
	X2	-1	0	1	2	3	4	5	6	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	19	20
2	R1	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8	-8	-9	-9	-10	-10
	X1	2	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	17	18	19	20	21	22
	R2	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14
	X2	-1	0	1	2	3	4	5	6	7	8	9	9	10	11	12	13	14	15	15	16	17	18	19	20	
3	R1	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8	-8	-9	-9
	X1	3	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	21	22
	R2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15
	X2	-2	-1	0	1	2	3	4	5	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	18	19
4	R1	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8	-8	-9
	X1	4	4	5	6	6	7	8	9	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	22	23
	R2	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	
	X2	-2	-1	0	1	2	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16	17	18	19	
5	R1	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7	-7	-8
	X1	4	5	6	6	7	8	9	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	22	23	24
	R2	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
	X2	-3	-2	-1	0	1	2	3	4	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	17	18
6	R1	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6	-6	-7
	X1	5	6	6	7	8	8	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	23	24	
	R2	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17
	X2	-3	-2	-1	0	0	1	2	3	4	5	6	7	7	8	9	10	11	12	13	13	14	15	16	17	18
7	R1	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5	-6
	X1	4	4	5	6	7	8	9	10	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	23	24
	R2	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18
	X2	-4	-3	-2	-1	0	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	16	16	17
8	R1	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4	-5	-5
	X1	4	5	6	7	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	20	21	22	23	24	25
	R2	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19
	X2	-4	-3	-2	-1	-1	0	1	2	3	4	5	6	6	7	8	9	10	11	12	12	13	14	15	16	17
9	R1	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3	-4	-4
	X1	5	5	6	7	8	9	10	11	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	24	25
	R2	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20
	X2	-5	-4	-3	-2	-1	-1	0	1	2	2	3	4	5	6	7	8	8	9	10	11	12	13	14	15	15
10	R1	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2	-3	-3
	X1	5	6	7	8	9	10	11	12	13	14	15	15	16	17	18	19	20	21	21	22	23	24	25	25	26
	R2	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21
	X2	-5	-4	-3	-2	-2	-1	0	1	2	3	4	5	5	6	7	8	9	10	11	11	12	13	14	15	16
11	R1	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2	-2
	X1	6	6	7	8	9	10	11	12	12	13	14	15	16	17	18	18	19	20	21	22	23	24	25	25	26
	R2	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22
	X2	-6	-5	-4	-3	-2	-1	0	1	1	2	3	4	5	6	7	7	8	9	10	11	12	13	14	14	15
12	R1	10	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1	-1	-2
	X1	6	7	8	9	9	10	11	12	13	14	15	16	16	17	18	19	20	21	22	22	23	24	25	26	27
	R2	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22
	X2	-6	-5	-4	-3	-3	-2	-1	0	1	2	3	4	4	5	6	7	8	9	10	10	11	12	13	14	15
13	R1	11	11	10	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0	0	-1
	X1	7	7	8	9	10	11	12	13	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	26	27
	R2	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23
	X2	-7	-6	-5	-4	-3	-2	-1	0	0	1	2	3	4	5	6	6	7	8	9	10	11	12	13	13	14
14	R1	12	12	11	11	10	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	0
	X1	7	8	9	10	10	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27	27	28
	R2	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24
	X2	-7	-6	-5	-4	-4	-3	-2	-1	0	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14

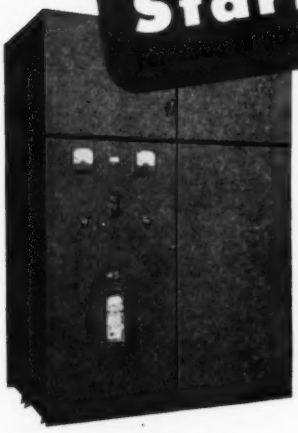
R1, X1 { Compensator settings of lagging regulator

R2, X2 { Compensator settings of leading regulator

CONTROL *Engineered* to help produce copper

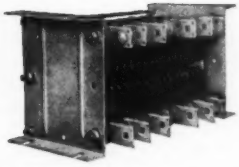


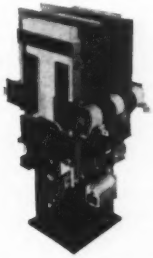
Starters



IT TAKES CONTROLLED POWER to process copper ore. Crushing run-of-the-mine ore in this giant jaw crusher, for example, takes a 300-horsepower wound-rotor motor and an Allis-Chalmers Type H Starter engineered especially for extremely high starting inertia and variable loads.

A-3670





THIS STARTER controls the motor to provide smooth acceleration in overcoming the inertia of heavy crusher jaws and large fly wheels. This is accomplished by means of a full automatic starter having six secondary accelerating steps.

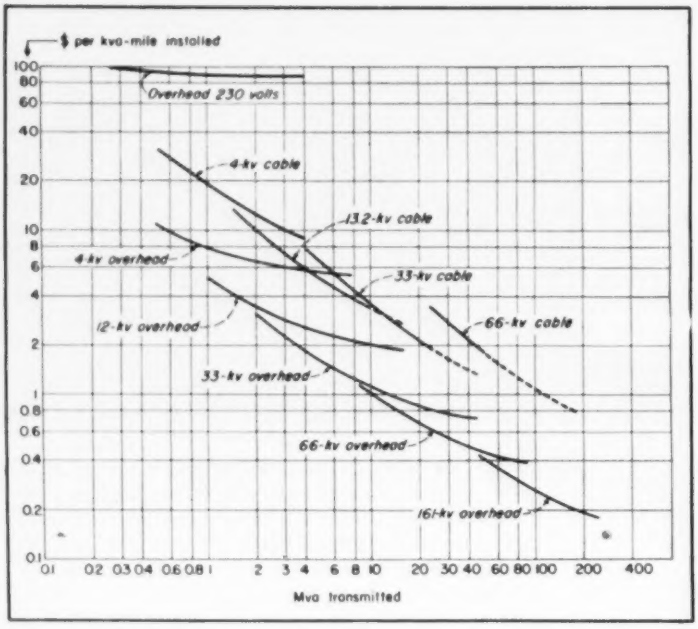
EXTRA HEAVY DUTY resistors in the motor secondary circuit provide starting torque and smooth acceleration. Adjustable time delay relays control closing of the accelerating contactors to cut out successive resistor banks . . . automatically bringing the crusher to speed.

SELECTION OF PRIMARY CONTACTORS for every Allis-Chalmers controller is based strictly on job requirements. Allis-Chalmers high voltage starters have either oil-immersed or air-break contactors as standard.

ALLIS-CHALMERS

There are Allis-Chalmers controllers for use in every industry...starters for squirrel-cage, wound-rotor and synchronous motors. For starters up to 2500 hp at 5000 volts — check with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 14B6410A.

Installed Cost of 3-Phase Lines with Most Economical Conductor for Kva Transmitted



D. D. CLARK, Consulting Electrical Engineer, System Planning Dept, Kansas City Power & Light Co, Kansas City, Mo.

In developing the accompanying curves, based on Kelvin's law, estimated values for the following factors were incorporated in the calculations: Fixed cost for any voltage and location of line; variable cost depending on conductor size; cost due to line losses at leak load, which tie up plant capacity; fuel costs caused by the line losses; and carrying charges on capital investment.

Applying estimated values for these factors to the problem of comparing the economical applicability of several voltages of transmission and distribution, the curves compare the cost of 3-phase lines with varying kva carried. The indicated installed costs are on a comparable basis and are not intended to indicate the actual cost of construction of any specific installation or any company.

Example: 15 mva peak load is to be transmitted 10 miles; a single overhead line is permissible. 12 kv, 33 kv, 66 kv, and 161 kv are available.

The graph shows that 66 kv is preferred, 33 kv is a fairly close second and 12 kv is ruled out because it will cost at least twice as much. The 161 kv will cost approximately 40/15 x 0.425 = $1.13 per kva per mile as against $0.79 for 66 kv and may be dropped.

33 kv @ $0.94 x 10 miles x 15,000 kva	= $141,000
66 kv @ $0.79 x 10 miles x 15,000 kva	= $118,000
Available for added expense of 66-kv facilities	= $ 22,500

As the 66-kv substation facilities are somewhat more costly, other marginal system considerations will probably determine which of these voltages should be used. Specific estimates should be prepared for both voltages with full consideration of respective advantages for this job.

Estimated 3-Phase Line Cost Per Mile

Assumptions:	
Demand value of supply plant, $/kw	160.50
Capitalized value of energy losses @ 12%, $ kw	109.50
Total value of losses capitalized, $/kw	270.00

Circuit	Fixed Cost per mile, $	Variable Cost per Kva, $	Cir Mil Copper per amp
230-v overhead	2,718	85.60	1,400
4-kv overhead	2,980	4.94	1,400
12-kv overhead	3,540	1.65	1,400
33-kv overhead	5,010	0.60	1,400
66-kv overhead	7,310	0.30	1,400
161-kv overhead	13,980	0.19	1,400
4-kv, 3c PAL Cable in duct	14,250	5.32	1,300
13.8-kv, 3c PAL Cable in duct	11,160	1.63	1,280
33-kv, 3c PAL Cable in duct	28,260	0.69	1,225
66-kv, 3-1c PAL Cable in duct	68,600	0.40	1,085

PAL = paper insulated, lead covered

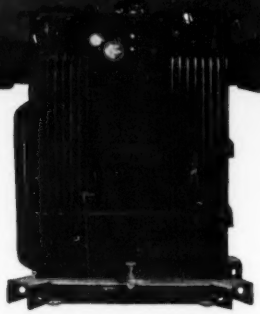
NOTES: $160.5 is taken as a conservative value since additions to plant are required to supply the peak load energy loss.

50% load factor, 30% loss factor, 5 mill energy cost and 12% required gross capital earned under a conservative value.

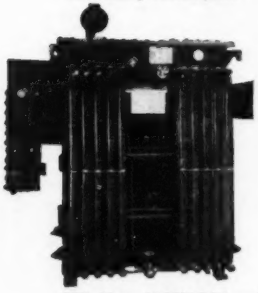
Line costs were analyzed on basis of available data as a "fixed" cost varying with voltage and a "variable" cost proportional to conductor section. Circular mil per amp defines the conductor size.

Dotted portion of cable curves requires thermal consideration.

MOLONEY *Askarel* TRANSFORMERS



500 Kva 4800-240 volt, three-phase, sixty cycle, Askarel Load Center Transformer with throats for connection to primary and secondary switchgear.



500 Kva 4160Y-240 volt, three-phase, Moloney Askarel Transformer

for SAFETY and ECONOMY!

Where Non-inflammable Transformers are required—either Indoors or Outdoors

Because Moloney Askarel Transformers are cooled and insulated with Askarel, a non-inflammable liquid, they are suited to use in applications where oil-cooled transformers would be hazardous to life and property.

Askarel Transformers are ideal for indoor installations. However, their weatherproof construction permits outdoor installations such as in mines, on roofs, in street and sidewalk vaults for a-c network systems, etc.

Askarel Transformers effect savings in installation costs because expensive fireproof vaults are not necessary. Because the transformer can be located at the center of the electrical load, expensive runs of secondary copper are eliminated. This also provides improved voltage regulation.

HRBB-38

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = BETTER PERFORMANCE, GREATER RELIABILITY, LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

You can solve any power puzzle

with U. S. Rubber Electrical Wires and Cables

For over 60 years United States Rubber Company has been manufacturing electrical wires and cables. Today, the range of these "U. S." products contains the answer to almost any wiring problem you may meet.

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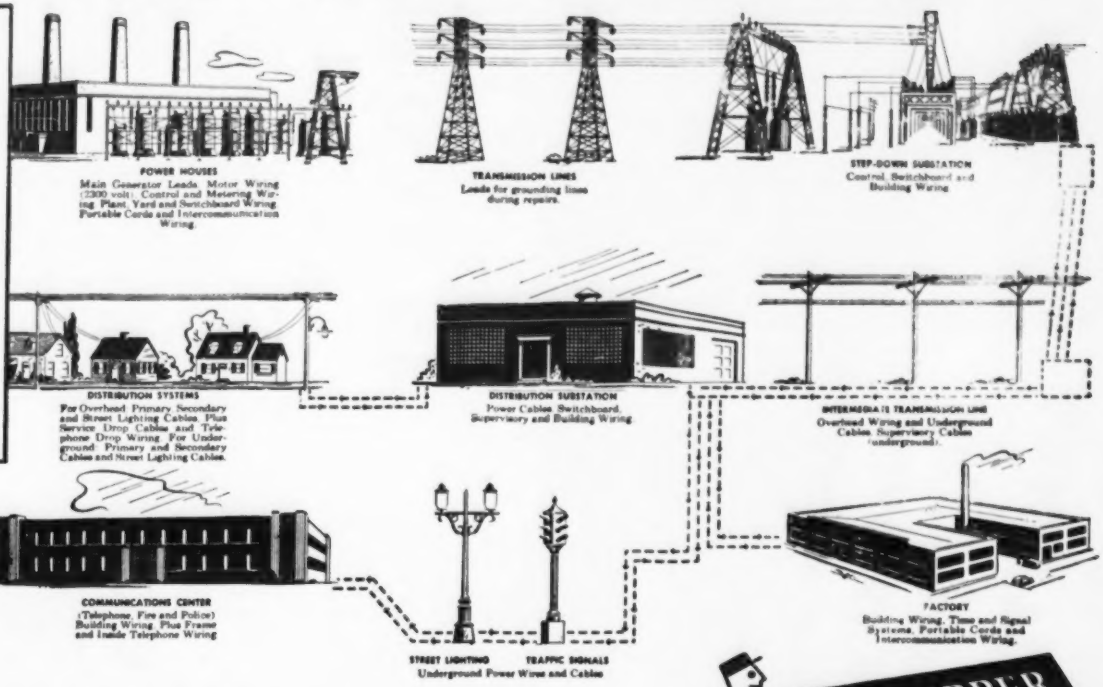
POWER HOUSES
Main Generator Leads, Motor Wiring (2300 volt), Control and Metering Wiring, Plant, Yard and Switchboard Wiring, Portable Cords and Intercommunication Wiring.
TRANSMISSION LINES
Leads for grounding lines during repairs.
STEP-DOWN SUBSTATION
Control, Switchboard and Building Wiring
DISTRIBUTION SYSTEMS
For Overhead Primary, Secondary and Street Lighting Cables. Plus Service Drop Cables and Telephone Drop Wiring. For Underground Primary and Secondary Cables and Street Lighting Cables.
DISTRIBUTION SUBSTATION
Power Cables, Switchboard, Supervisory and Building Wiring
INTERMEDIATE TRANSMISSION LINE
Overhead Wiring and Underground Cables (Supervisory Cables Underground).
FIRE ALARM SYSTEMS
POLICE CALL SYSTEMS
Underground Communication Wires and Cables
COMMUNICATIONS CENTER
(Telephone, Fire and Police) Building Wiring, Plus Frame and Inside Telephone Wiring
STREET LIGHTING
TRAFFIC SIGNALS
Underground Power Wires and Cables
FACTORY
Building Wiring, Time and Signal Systems, Portable Cords and Intercommunication Wiring.

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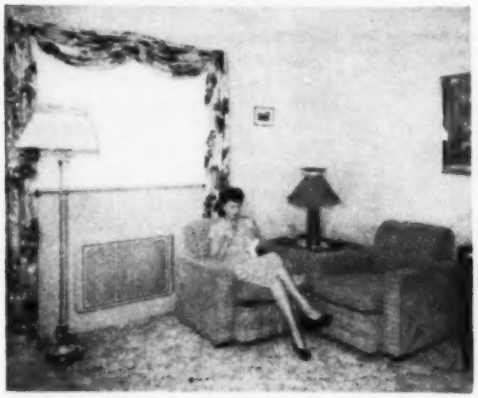
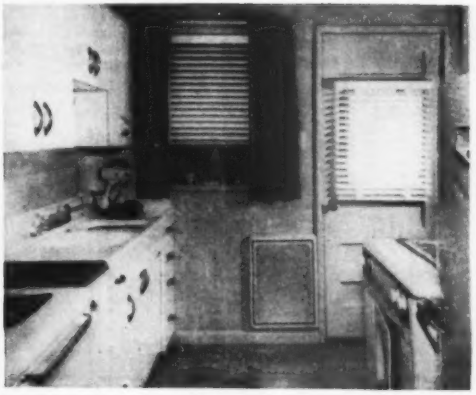


HOUSEWIFE is able to work as contentedly in the living room . . .



. . . as she can in the kitchen with the help of radiant heating

Electricity Heats Housing Project

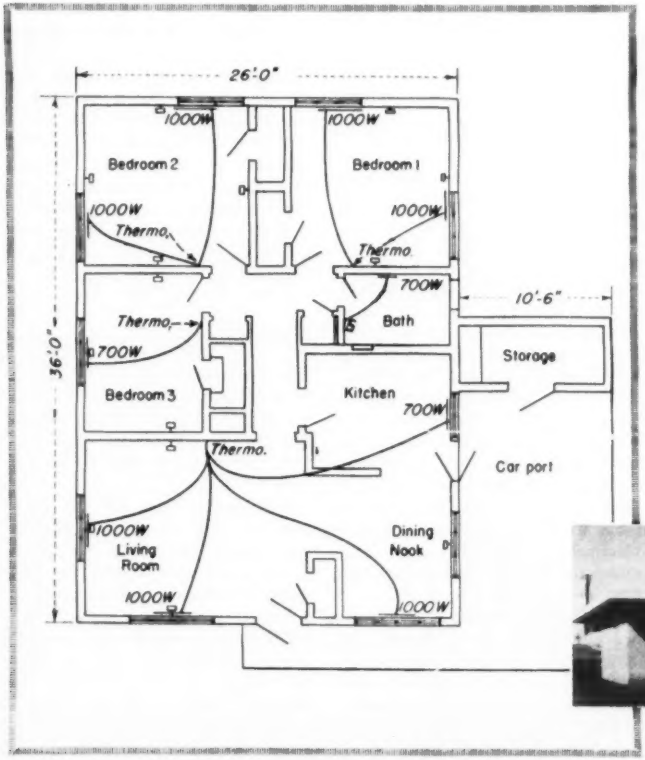
Temperate climate lends itself to radiant space heating, Southwestern utility finds. Heavy summer load complemented

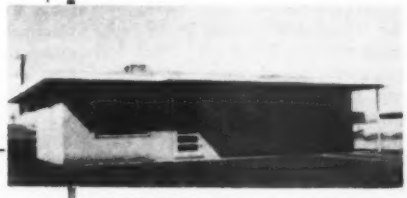
H. E. SAMSON, Division Manager, Pecos Valley Division, Southwestern Public Service Co

How does a power company offset during the winter a summertime electrical load becoming heavier each year because of growing air cooling and irrigation? To utility people in cooler climates this is an academic question. But to us, located in the arid and temperate Southwest, it represents a real problem.

One logical answer would seem to be electric space heating. The mild weather conditions would make home heating requirements less heavy and thereby minimize its expense. At first glance, however, electric home heating seems impractical because our area abounds in natural gas, which gives us plenty of competition.

But electric heating has finally made a dent in the supremacy of gas, just as has electric cooking and water heating. Our opening was provided by





FLOOR PLAN at left shows wiring diagram for typical house in project

Survey of Operational Cost on Radiant Panel Heating

Total Kwhr	Kwhr Radiant Heating	Kwhr Water Heating	Kwhr deg. Day (Heating)	Average Kwhr per Day Radiant Heating	Average Kwhr per Day Water Heating
(780 sq ft area)					
6,656	4,976	1,680	2.18	29.6	10
9,928	8,248	1,680	3.26	49.1	10
4,696	3,016	1,680	1.54	18.0	10
8,092	6,412	1,680	2.65	38.2	10
936 sq ft area)					
7,536	5,856	1,680	2.47	34.9	10
9,380	7,700	1,680	3.08	45.8	10
12,310	10,630	1,680	4.04	63.3	10
8,688	7,008	1,680	2.85	41.7	10
8,752	7,072	1,680	2.87	42.1	10
9,776	8,096	1,680	3.21	48.2	10
9,760	8,080	1,680	3.20	48.1	10
6,376	4,696	1,680	2.09	28.0	10
9,438	7,758	1,680	3.10	46.2	10
7,536	5,856	1,680	2.47	34.9	10
9,194	7,514	1,680	3.02	44.7	10
3,592	1,912	1,680	1.18	11.4	10
10,560	8,880	1,680	3.46	52.7	10
10,560	8,880	1,680	3.44	52.5	10
6,276	4,596	1,680	2.06	27.4	10
10,078	8,398	1,680	3.30	50.0	10
8,530	6,850	1,690	2.80	40.8	10
Total 177,628	141,348	35,280	58.27	847.6	210
Average ...8,458	6,778	1,680	2.77	40.4	10

Radiant Panel Heaters—1000 w, thermostatically controlled, 2 panels per room. Kitchen, 1 panel. Bath, wall insert heater, 700 w.

Survey Period: October 16, 1951, to April 1, 1952

Total days involved, 168

Average kwhr per day on water heater based on past tests and survey

Average Temperatures:		Degree Days:	
Oct.	62.9	Oct.	119
Nov.	45.6	Nov.	573
Dec.	41.9	Dec.	711
Jan.	45.6	Jan.	598
Feb.	45.0	Feb.	574
Mar.	48.3	Mar.	519
			3,074

a housing project built at the Walker Air Force Base in our Pecos Valley Division headquarters city of Roswell, N. M., which has swelled in population from 13,000 to 30,000 during the past decade.

The 30 homes in the development are of flat top stucco construction with steel casement windows. Other homes of this type have proven unsatisfactory for gas-fired pilot light equipment because they are so well sealed to guard against infiltration of dust that air circulation is at a minimum. With this in mind, glass panel heating and electric water heaters were installed; as were electric ranges, refrigerators, air conditioning units and automatic washers.

The space heaters are 20 in. by 26 in. and are rated at 1,000 watts, with the exception of the one in the bathroom rated at 700 watts. There are two panels in each room, with the exception of the kitchen and bathroom, each of which has one panel.

Panels are located beneath the windows in all rooms and each room has individual thermostatic control.

Houses are of two sizes: 780 sq ft and 936 sq ft. Average load for the small units is 7.7 kw and, in the case of the larger ones, 9.7.

A 168-day survey between October and March on 21 of the units revealed that average daily kwhr consumption for space heating was 40.4, with a high of 63.3 kwhr and a low of 11.4.

Average for the 3,074 degree days during the test period was 2.77 kwhr. Rate for panel heating, which is metered separately along with water heating, is one cent per kwh. On an average monthly usage of 1,212 kwhr the heating bill was $12.12 a month.

There has been no major complaint against cost in the trial project. General reaction of consumers is that the cleanliness, safety, and convenience make any additional cost worthwhile. Only sources of irritation are the interior decorating problem created by placement of the heaters in the walls under the windows and the impossibility of using draw drapes.

There are problems with electric heating but none of them appears unsurmountable. Its home heating possibilities in a climate such as ours, coupled with its load-leveling characteristics make it a load worthy of further experimentation and development.

Electric Water Heating, Cooking Popular on Coast

That more than two-thirds of homes served by Pacific Power & Light Co are cooking and heating water electrically was among significant findings in an appliance survey conducted by the utility this year. Percentages of homes using the various appliances are as follows:

Ranges	71
Water heaters	69
Refrigerators	92
Radios	97
Freezers	11
Washers	22
Clothes dryers	5
Bed coverings	6

Accompanying analysis of buying intentions disclosed that ranges, water heaters, and home freezers are top prospects with housewives. About one in every six expects to purchase at least one of these. Automatic washers are close behind in popularity with the home-makers.

Home Laundry Booklet

"A Sketch Book for a Modern Home Laundry" is the title of a new 16-page booklet prepared for General Electric dealers for distribution to their customers and prospective buyers.

Covered in detail is the planning, building, arrangement, and selection of equipment for the modern home laundry. Designated as "Publication 14-132," the booklet is available from GE major appliance distributors across the country.

Heat Pump Water Heaters

In a talk before Chicago's Electrical Modernization Conference recently Gil Freyder, Commonwealth Edison, described 18 installations where heat pumps are heating water on a test basis.

Wattage is only 840 as compared to 2,500 watts in the conventional water heater. For this reason no off-peak control is required. Cost would be perhaps $100 higher than that for a conventional electric water heater but operating cost, based on the 18 test installations, would be $2.56 per month compared to $4.30 per month for the same amount of water heated to the same temperature with a conventional water heater.

USE ANHYDREX

Water in some form or other causes more interference with satisfactory cable service than any other one thing. Even small amounts of moisture finding their way into cables can put important power circuits out of business.

Cables in ducts are nearly always exposed to water. Even aerial cables can suffer from water. That is why you should use ANHYDREX cables to keep your amperes dry. With Simplex Anhydrex rubber insulation you need not use a lead sheath. ANHYDREX cables will function satisfactorily even under the wettest conditions.

You can avoid cable troubles on your important network and feeder circuits by using Simplex Anhydrex insulation on your cables. In that way you assure yourself that your amperes will always be dry. If you would like to know more about this dependable, long-lived insulation, simply send a request to the address below.

SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

General Electric Co

FLOODLIGHTS permit round-the-clock usage of 13-acre outdoor working area, and unrestricted movement of aircraft at all hours. Night accident rates in area are no higher than in daytime. Average light intensity is 5 ft-c produced by 600 floodlights

Floodlighting Permits 24-Hr Utilization of Outdoor Area

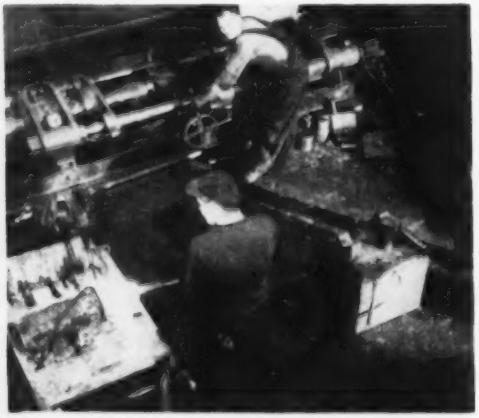
Round-the-clock utilization of 555,000 sq ft of outdoor working area at the Columbus, Ohio, plant of North American Aviation, Inc, is made possible by 600 floodlights.

Forty-one banks of floodlights, mounted at a height of 48 ft, provide the light for the large outdoor working area which is used for final pre-flight testing of engines, fuel flow, radar adjustment, compass alignment, and painting.

North American officials report that installation of the floodlights has provided an additional night working area of almost 13 acres, and has made possible unrestricted movement of aircraft at all hours. In addition, officials say that night accident rates in the outdoor area are no higher than in the daytime. The floodlights ranging from 500 to 1500 w provide an average, constant light intensity of 5 ft-c.

Induction Furnace Doubles Forging Output

FRANK A. KENDER, Industrial Representative, Cleveland Electric Illuminating Co



RAPID HEAT CYCLE of induction furnace heats 3-in. bar end to 2300 F forging temperature in 2 min. There is little time for scale to form, dies last longer, work is cleaner and has greater dimensional accuracy with little wasted material

An induction furnace enables the Commercial Forgings Co, Cleveland, Ohio to double their last year's output of upset forgings. With the induction heat, a forging is turned out every 2½ min. Previously, the output was running between 30 and 60 a day.

Because the furnace reaches the desired temperature almost immediately, time lag between forgings has been eliminated. The company expects to triple its production of 3-in. forgings after several modifications in the induction heat setup are made.

The company is also pleased with the operating economy of the furnace. Since the heat is excited within the bar itself, efficiency is high, no heat is wasted. Current consumption per pound of heated steel is low.

The flexibility of the furnace makes the work easier. Although 20 different bar sizes are produced, they can change from one size to another without making costly adjustments.

Workers operating the furnace and nearby forging machines appreciate the cleanliness of induction heat and the absence of fringe-heat and fumes. Furnace load is 200 kw. Generator is 310 hp.

6 BIG REASONS WHY VICTOR PURIFIED PORCELAIN SWITCH and BUS INSULATORS ARE BETTER!

VICTOR NO. 742 (NEMA TR-No. 7). For complete engineering data on all Victor Switch and Bus Insulators, send for Bulletin No. 5.

1. Improved thermal resistance. Purified Porcelain, pure porcelain all the way through, expands and contracts more uniformly during sudden temperature changes.
2. Unmatched porcelain hardness and density, resulting in rock-like strength.
3. Higher average puncture values.
4. Better tension, torsion, cantilever and impact values.
5. Smoother, harder glaze with unequalled self-cleaning characteristics.
6. Finest insulator porcelain ever made—uniformity of quality never before achieved!

Specify VICTOR SWITCH and BUS INSULATORS

VICTOR INSULATORS, INC., VICTOR, N.Y.

DOW CORNING SILICONES

make motors last longer

Photo courtesy Whirlpool Corporation, St. Joseph, Michigan

Saved Six $1200 Failures in 18 Months

In exhausting fumes from a line of paint spray booths, this 20 hp fan motor repeatedly painted itself to death. After about 3 months of service, the paint built up so heavily on the fan blades that the motor burned out. Each failure halted production on a 300 man assembly line; cost over 450 man hours or about $1200 per failure.

Maintenance engineers had to choose between having the fan cleaned every day, installing a larger motor, or rewinding the old one with Dow Corning Silicone (Class H) Insulation. The economy of choosing Silicone insulation is proved by the fact that this motor, rewound with Class H materials, has been operating 20 hours a day for over 18 months, or 6 times its previous life. Savings so far amount to about $7200.00.

Such performance in thousands of installations has proved that Dow Corning Silicone (Class H) insulation has 10 to 100 times the life expectancy of the next best class of insulating materials; increases the power per pound ratio in electric machines by as much as 50%.

Eliminate another common cause of motor failure; lubricate bearings with Dow Corning 44 Silicone Grease.

Especially designed for ball bearings operating at a maximum speed factor (bore in m.m. x rpm) of 150,000 to 200,000 and at temperatures from —40° to 400°F, Dow Corning 44 Grease is practically nonvolatile and highly resistant to oxidation. In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

mail this coupon *Today!*

Dow Corning Corp., Dept. AY-23, Midland, Michigan
Please send me
- ☐ More information on Class H Insulation
- ☐ List of Class H motor repair shops
- ☐ Data on Silicone Grease for motor bearings
- ☐ 32-page booklet entitled "What's A Silicone?"

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Company _____
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City _____ Zone ____ State _____

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INDUSTRIAL BRIEFS

Nylon lace setting is improved at A. G. Mercer Co, Lonsdale, R. I., by infrared radiant heating installation. Production is increased, product quality is improved, spoilage and cost of operation have been reduced. Equipment consists of aluminum sheathed panels containing radiant heating elements embedded in Fiberglas, arranged horizontally a few inches above the 6 or 12-ft widths of lace as it comes out of the drying oven. Temperature is accurately controlled in the 450 to 700 F range, and the panels automatically rise when the travel of the fabric stops. Operation is at 240 v, unity power factor, continuous cycle, and represents 14 to 40 kw of load. L. M. Knapp, VP, Blackstone Valley Gas & Electric Co., Pawtucket, R. I.

Heating conveyor system and hopper has eliminated breakdowns of conveyor system, due to freeze up, at the Kaiser Aluminum and Chemical Corp, Newark, O. Conveyor system transports coal from an outdoor hopper to within the plant. During winter months, moisture collected in the hopper during periods of inactivity and froze, locking conveyor system. When system was started, links in chains of conveyor system would pull apart. Installation of 6 kw of rod-type radiant heaters under conveyor system and hopper, removed moisture and eliminated freezing. Not one breakdown has occurred since this equipment was installed. D. E. Dome, Ohio Power Co, Newark, O.

Forced drying of thermo-setting glue for gluing laminated plastic to plywood backing for tables, sink and kitchen counters, etc, using two 4500-w, 220-v electric rubber blankets at Wood Products Co, Sacramento, Cal., gave tight bond in 20 min which formerly required two hours with air drying. A two-shift operation has been reduced to one shift. Blankets are 3 x 16 ft and 4 x 10 ft and have middle layer of carbon-impregnated rubber sandwiched between two layers of hard rubber. Semi-conductor middle layer furnishes heat. Blankets are used in two presses and are equipped with automatic temperature control. This method of heating was used instead of another method considered, consisting of costly heavy cast iron platens heated with internal coils using gas heated water. Marlen Davis, Industrial Power Engineer, was responsible for selling customer on this electrical method of drying. E. A. Heath, Supervisor, Commercial & Industrial Development, Sacramento Municipal Utility District.

Paint baking with a continuously moving infrared car baking unit provides more rapid drying and a better quality finish at the Judge Motor Corp, Rochester, N. Y. The use of old fashioned air-drying methods required 3 to 4 days and sometimes longer, depending on weather conditions, whereas infrared can do an even better paint baking job in about ½ hr. The unit consists of 132 infrared lamps (250-w), and is provided with a motor drive which moves the infrared bank back and forth along the length of the car while the car stands still. A more uniform baking job is assured with a finish which is more resistant to soap and alkalis and is much harder and tougher than other finishes. D. A. Sweetland, Eng., Comm & Ind Sales Dept, Rochester Gas & Electric Corp.

Edwin L. Wiegand Co

EMBEDDED in concrete sidewalk, electric heating cable keeps it dry during snow storm. Heat intensity of 40 w per sq ft is expected to melt the heaviest snowfalls anticipated

Cable Reduces Snow Removal Costs

One of the largest snow-melting installations using electric heating cable was recently completed at the new John T. Ryan Memorial Laboratory of Mine Safety Appliances Co, Pittsburgh, Pa.

Operating cost, based on an average Pittsburgh winter, is estimated at about $50 a year—lower than the cost of snow shoveling and ice-chopping—and more effective. On call day or night at the flip of a switch, cable can be energized to keep sidewalk dry from the beginning of a snow storm to the end.

Seventy-two standard heating cable sets of 800 w each were embedded in 1440 sq ft of concrete sidewalk along two sides of the building. With an installed capacity of 57.6 kw a heat intensity of 40 w per sq ft is obtained—sufficient to melt the heaviest expected snowfalls as fast as the snow arrives.

The standard 160-ft cable lengths were first fastened to 5 by 20-ft sections of 6 in. by 6 in. commercial mesh with hog-ring staples. After an initial pouring of concrete, the mesh was laid in place and covered with another inch of concrete. Just before the concrete was smoothed the 10-ft cold leads were strung through piping and connected to junction boxes under the lawn.

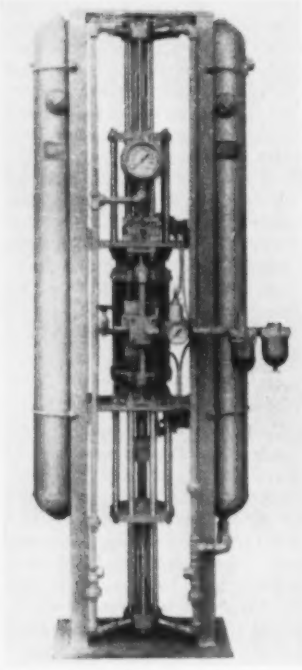
NEW EQUIPMENT

DC Welder

Designed to fit crosswise in a standard pick-up truck, the type WD-42AGW is an engine-driven dc arc welder with a 60% duty cycle. For repair, maintenance, and construction work, the welder's current range is 40 to 250 amp.

The air-cooled engine eliminates coolants and anti-freeze. A vacuum-type device idles the engine when welding is not being done, thus saving gasoline. Optional equipment includes a trailer equipped with fittings for pressure lubrication.

General Electric Co, Schenectady 5, N. Y.



Air-Hydraulic Pumps

Designed to develop high fluid pressure from low air pressure, for operating high pressure cylinders, clamps, valves, actuators, hydraulic presses. Built as package, ready for installation. Both pressure and volume are adjustable.

Ledeen Manufacturing Co, Los Angeles 15, Calif.

Retractable Reel

Made of cast aluminum, for handling up to 150 ft of multiple conductor rubber sound or communication cables, up to size No. 4. Rachet will function in any position, can be locked out. Unit is ball-bearing throughout.

Industrial Electrical Works, Omaha 2, Nebraska.

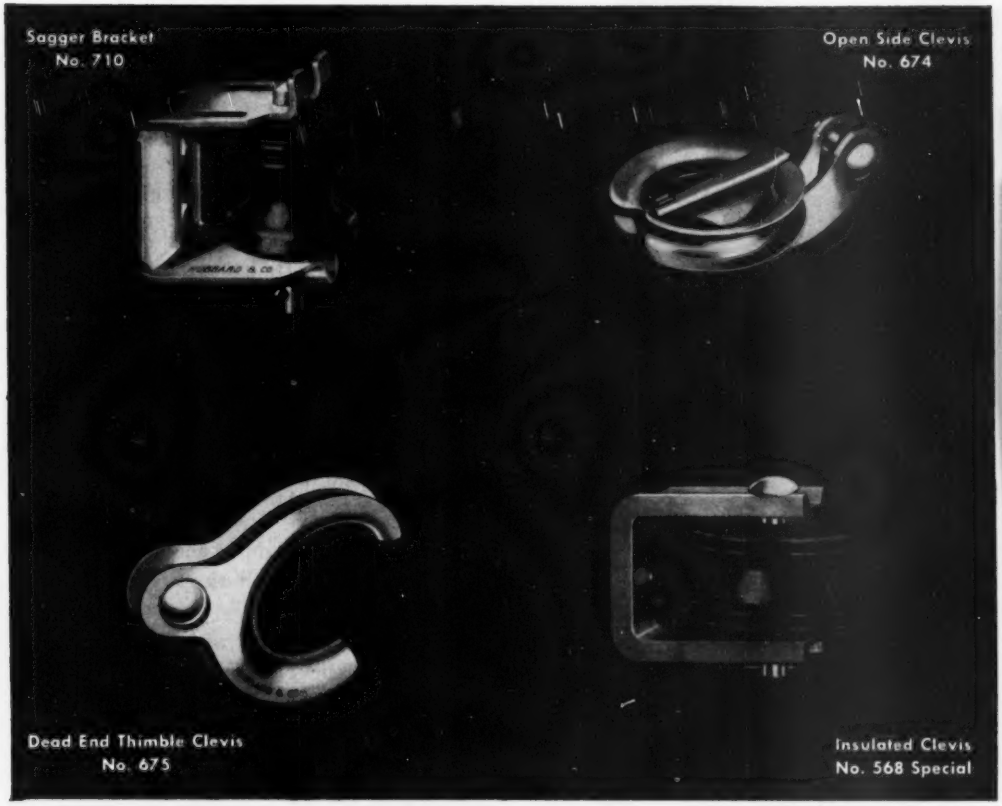
Recloser

Type L—With 200-amp rating, interrupting rate 4,000 amp at 14.4-kv line-to-line nominal voltage. Choice of four time-current curves and ten tripping sequences, cross-blast inter-

for your **ALUMINUM SECONDARIES**

SINGLE CONDUCTOR OR CABLE

. . . HUBBARD CLEVISES



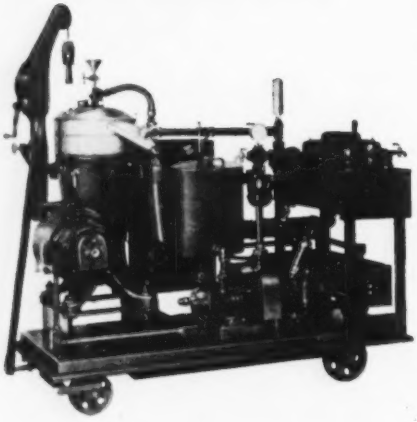
The increasing use of aluminum for single conductor cables and in ACSR has brought numerous inquiries as to appropriate clevises and other accessories on such lines. Here are a few from a large number of Hubbard items which are recommended for such use. Write for detailed information.

HUBBARD COMPANY

NEVER A DROP LEFT OVER!

A De Laval Centrifugal Oil Purifier is complete insurance that your insulating oil will be ***completely*** dry. Centrifugal force, acting on transformer or circuit breaker oil, removes every bit of moisture. Not a drop remains to impair dielectric strength.

So efficient is the De Laval method that it is possible to guarantee that when operated at its rated capacity, each De Laval Insulating Oil Purifier will reduce the water content of new transformer oil at a temperature of 90° F from an initial 1/10 of 1% to one part water in 100,000 parts of oil . . . 1/1,000 of 1% (35 kv dielectric strength).



De Laval purification is accomplished in a single pass through the centrifuge. The dehydration is accomplished without the aid of the filter press, which is necessary only for the removal of colloidal carbon from circuit breaker oil.

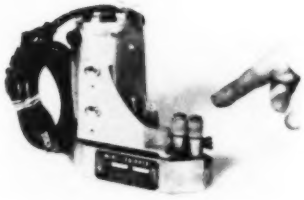
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

INSULATING OIL PURIFIERS

DE LAVAL

rupting structure said to give rapid arc extinguishment. Selector plate may be rotated to change time-current curves.

Type E—interrupting rate to 1,750 amp at 23 kv, 2,500 amp at 14.4 kv, nominal line-to-line voltage. 8 coil ratings, 3 time-current curves, 7 tripping sequences. BIL of 150 kv.
Line Material Co, Milwaukee 1, Wis.



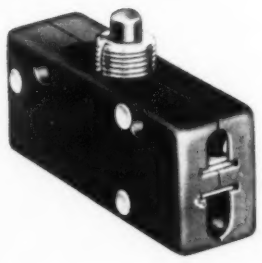
Fluorescent Lights

For instruments and panels, cool-burning white-daylight 4-w 6-in and 8-w 12-in lamps with starters and ballasts.

Toggle switch provides for independent lamp operation.
Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa.

Miniature Wire Stripper

Designed for removing film insulations from AWG 50 to AWG 40 wire, for use in conjunction with coil winding machine. Stripper uses $\frac{5}{8}$-in dia Fiberglas wheels which melt insulation and wipe away residue.
The Eraser Co Inc, Syracuse 2, N. Y.

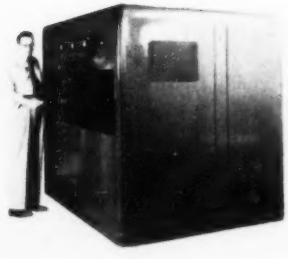


Snap Switch

$1\frac{7}{8}$ x 25/32 x 19/32 in., said to give instantaneous make and break for over a million actuations. Available with plug-in or slide-on terminals, as well as conventional terminals and wire leads.
Soreng Manufacturing Corp, Schiller Park, Ill.

Microwave Receiver

Four wide-band receivers cover 1,000 Mc to 10,750 Mc. Triple tuned rf preselection said to insure high image rejection; high gain stability allows receiver to serve as field intensity meter.
Polarad Electronics Corp, Brooklyn, N. Y.



Induction Heater

To provide 50-kw heat at 400,000 cycles per second on a 100% duty cycle, from 230, 460, 550-v 3-phase 60 cycle, 90% power factor. Unit is 96 x 68 x 80 in., weighs 5,400 lb. Built-in closed water system.
Lindberg Engineering Co, Chicago 12, Ill.

(Continued on page 152)

Don't just write—

Specify JENKINS

Gold Seal Tape

...and SAVE

Goes further—Here's why

GUARANTEED FOOTAGE— You get full measure with every roll. Tapes up tight to the last inch.

NO WASTE— Gold Seal Friction Tape tears evenly, won't ravel, molds to uneven surfaces.

HIGH DIELECTRIC— Less footage is needed per job. No pinholes, one thickness insulates.

LASTING "TACK"— Gold Seal sticks to the job under toughest conditions of cold and moisture.

EASY HANDLING— Gold Seal does not peel, dry out or smear the hands in hottest weather.

FRICTION and RUBBER TAPES
In either 10-roll cartons or single rolls. Every roll sealed in cellophane, stays fresh. Jenkins Bros. (Rubber Division), 100 Park Ave., New York 17.

IT'S YOUR BEST BUY FOR PLANT SUPPLY

Jenkins Bros. make Diamond Seal Friction and Rubber Tapes which also meet ASTM Specifications.

The latest achievement in modern street lighting

the NEW OV-20

MERCURY-VAPOR STREET LIGHT

It's New . . . Completely redesigned to put more light on your streets, the new OV-20 combines top efficiency with modern design in a unit that's easier to install and maintain than ever before.

It's Efficient . . . It tops all records in coefficient of utilization (light directed to the street) . . . and over ¾ of the total light output is directed to the street side of the unit.

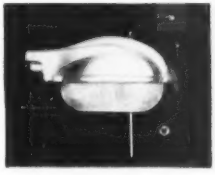
It's Mechanically Strong . . . One-piece, sturdy construction, weatherproof seal and nonferrous metal parts are important factors in eliminating maintenance replacement expense.

It's Easy to Maintain . . . Cleaning, washing and relamping can be done without tools . . . without exposing the wiring or damaging the reflector . . . in a minimum of time—the key to street lighting economy.

It's Attractive . . . Both the style of the luminaire itself and the appearance of the lighted street will speak for itself in winning public acceptance.

J-04326

You'll want to see it . . . you'll want to read about it . . . you'll want to install it. Call your nearest Westinghouse office and make an appointment for a personal demonstration . . . or send for B-5657, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.



YOU CAN BE SURE . . . IF IT'S

Westinghouse

LIGHTING DIVISION

Edgewater Park, Cleveland, Ohio

A typical modern industrial plant where Hevi Duty Transformers provide efficient electrical distribution.

75 KVA
3 Phase
60 Cycle
480-120/208 Y
TRANSFORMER

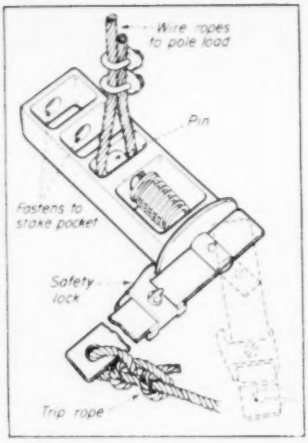
Install
HEVI DUTY
DRY TYPE
TRANSFORMERS
at load centers
...and eliminate long, heavy secondary runs

Installations now operating in many nationally known industrial plants are proving the ability of Hevi Duty Transformers to provide efficient economical electrical distribution.

Conservative electrical design and the simple rugged construction of Hevi Duty Transformers assure many years of trouble-free service. STANDARD or SPECIAL types are available in sizes from 1/4 to 1000 KVA with primary ratings to 15,000 volts.

Write for Bulletin HD-499

HEVI DUTY ELECTRIC COMPANY
HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY
DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS
MILWAUKEE 1, WISCONSIN

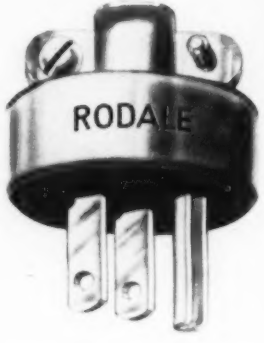


Pole Unloading Trip

Mounted on stake pocket at any angle, in either right or left hand position. Two or four trips may be used, in conjunction with 9/16-in. dia flexible wire ropes. Loop on cable end goes through stake pocket and is locked into the cast bronze trip. Both trips are released simultaneously with hand lines, and trips fall to ground.
Bodendieck Tool Co, Taylorsville, Ill.

Lead-Lag Ballast

For two 40-w rapid start lamps. Weighs 6½ lb, claimed quiet, normal operation of remaining lamp if one fails, stroboscopic correction. Catalog No 254-601.
Jefferson Electro Co, Bellwood, Ill.



3-Wire Caps

With U-shaped grounding blade which contacts the grounding connec-

New FREE 84 PAGE UNISTRUT Pocket Catalog NO. 800

for the MAN ON THE JOB!

84 pages crammed with ideas, pictures and data on how to frame, hang, support and mount all kinds of mechanical and electrical equipment with adjustable UNISTRUT All-purpose Metal Framing.

Perfect for the man on the job—most useful, too, as a handy reference catalog for the architect, engineer, draftsman, contractor, or builder. Just pocket size, easy to handle, always within reach when you want it. Order your free copy of the *NEW* UNISTRUT Catalog No. 800 today! With UNISTRUT channel and fittings you can build all types of conduit, cable, pipe and tubing hangers and supports, framing, mounts, racks, tables, benches, and many other structures with just a hacksaw and a wrench. No drilling, no welding, 100% adjustable and re-usable.

The UNISTRUT system of mechanical supports provides great strength without bulk. It's easy to work with, lasts indefinitely, and the finished structure assures neat and orderly appearance.

These are the Basic Components of the UNISTRUT Metal Framing System

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U. S. Patent Numbers: 2327587 2329815 2345650 2363382 2380379 2405631 2541908 Other Patents Pending

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New! PLASTIC SPACERS

for faster, easier installations

Intermediate Spacer

Base Spacer

Specially designed for use with BERMICO Fibre Conduit

LIGHT! Made of strong, lightweight plastic material molded at high pressure and temperature. Easy to handle and store.

DURABLE! Built to support heavy loading and to withstand rough handling during shipment and installation.

PRACTICAL! Furnished in single units that can be quickly combined into *any multiple* by fitting the tapered lugs of one piece into the tapered recesses of the adjoining piece. Convenient for stocking because the right multiple can be assembled to fit any job. Only complete line of spacers on market. Available in all standard dimensions.

ECONOMICAL! Cost *less* than most other types of spacers. Manufactured for use with Bermico by Jim Robbins Company.

BERMICO FIBRE CONDUIT comes in lightweight, easy-to-handle 8-foot lengths that can be cut and tooled right on the job. Water-tight couplings go on fast—no sealing compound needed. Smooth inside bore assures quick pull-through without abrasion. Complete line of bends. For superior cable protection and long service at low cost, *specify Bermico Conduit and plastic spacers*. For further information and samples write Dept. CB-11, Brown Company, 150 Causeway Street, Boston 14, Massachusetts.

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CORPORATION, La Tuque, Quebec

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NIBROC TOWELS • NIBROC KOWTOWLS • ONCO INSOLES
BERMICO SEWER PIPE, CONDUIT ▲ CORES • CHEMICALS

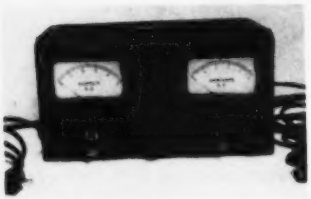
tion before the current-carrying blades make contact. Metal cord clamp on armored bakelite or soft unbreakable rubber. Rated 15 amp, 125v; cord hole dia 0.218 to 0.0630 in, outer dia 1½ in.

Rodale Mfg Co Inc, Emmaus, Pa.

Fastening Gun

For cable and hollow tube installation, this hand-held automatic machine is said to drive special extra-size band into wood, plaster, mortar joints, cinder or mineralite building blocks. Staples have ⅜ to ½-in leg lengths.

Heller Co, Cleveland 14, Ohio



High-Voltage Tester

With continuously variable voltage output and metered output current. Range: 0-5,000v dc, 0-5-10-50-100 microamps; size 14 x 9 x 7½ in, weight 24 lb. Designed for electric insulation test, dc resistance calculation. Ac ripple claimed within 1%.

Associated Research Inc, Chicago 18, Ill.

Weather-Protected Motor

For outdoor steam electric stations, designed to keep wind-driven heavy moisture out of its windings. Intake velocity is less than 600 fpm. No special concrete foundation or base is

T&B METHOD
Fittings and Tools for ALUMINUM and Copper Conductors

FOR ACSR & ALL-ALUMINUM CABLES

Tension Splicers

Dead Ends

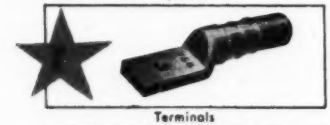
Jumper Splicers

Repair Sleeves

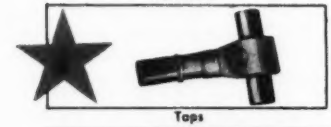
Light Portable Tools (for tower work)

FOR UNDERGROUND & INDOOR INSTALLATION

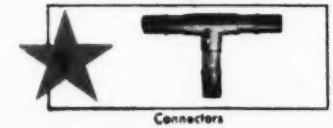
Splicers



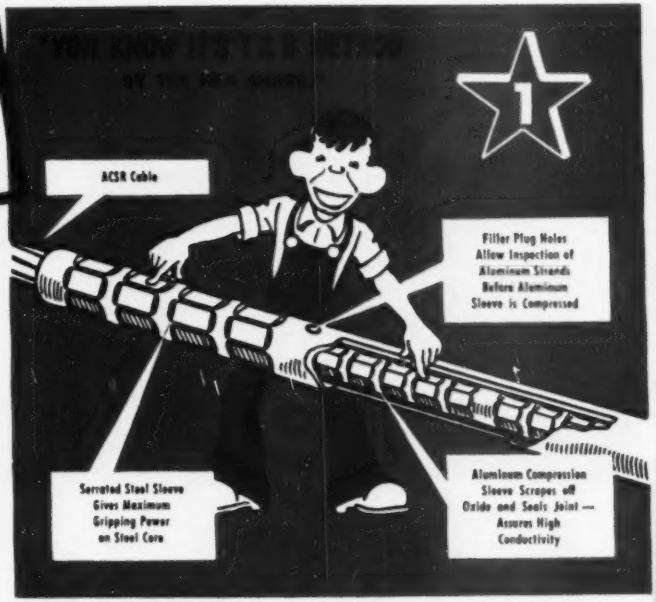
Terminals



Taps



Connectors


1
ACSR Cable
Filler Plug Holes Allow Inspection of Aluminum Strands Before Aluminum Sleeve is Compressed
Serrated Steel Sleeve Gives Maximum Gripping Power on Steel Core
Aluminum Compression Sleeve Scrapes off Oxide and Seals Joint — Assures High Conductivity

ACSR Tension Splicers develop minimum of 95% of cable strength

—when installed by the T & B Method

T & B Method Tension Splicers for ACSR are light in weight, easy to install. They take a tight, lasting grip on both steel core and aluminum conductor strands. Inside taper at ends of splice provides dampening effect to prevent vibration failures. Patented T & B Method of compression develops a minimum of 95% of ultimate breaking strength of cable—with a conductivity better than the cable!

Tooling is Light — Portable — Powerful . . . and Economical!

Tools are easy to carry—easy to use on the tower. An installing head weighing only 34 pounds develops 40-ton pressure. The T & B Method saves you money because one tool and die install all fittings — tension splicers, dead ends, jumper loop splicers—for a single size of ACSR cable.

ENGINEERED RIGHT . . . DISTRIBUTED RIGHT

T & B Method fittings and tools, like all T & B quality fittings, are designed for lowest installed costs. They're furnished exclusively through local T & B distributors under the T & B Plan.

FROM CIRCLE TO HEX IN SECONDS

You start with a circular cable (a typical one consists of about 75% metal, 25% air). You compress it, by the T & B Method, to the equivalent area of a solid rod—as the dies force the fitting from circular to the characteristic T & B Method hexagonal shape—all in the space of just a few seconds!

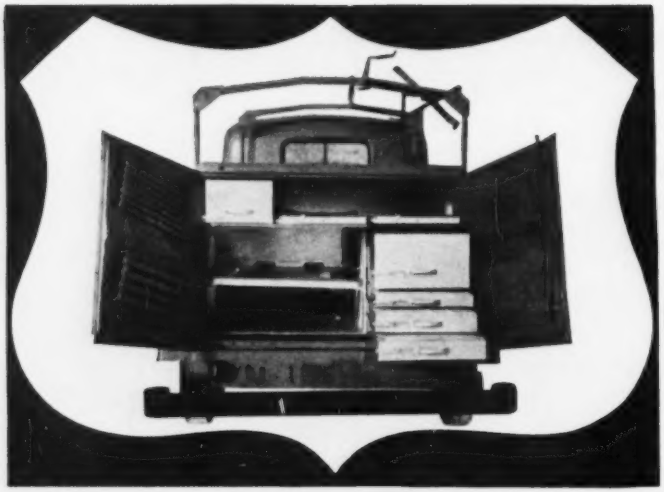
FOR THE FULL STORY ON THE T & B METHOD, WRITE FOR BULLETIN #67

THE THOMAS & BETTS CO.

INCORPORATED

35 Butler Street
Elizabeth 1, New Jersey
Thomas & Betts, Ltd., Montreal, P. Q., Canada

THERE'S A T&B ENGINEERED PRODUCT for every wiring job in the complete T & B line of fittings for all conductors and raceways



HIGHWAY
Installer's Unit
Compact arrangement-
Rugged Construction

The thousand-and-one pieces of material and tools that your installation, maintenance and servicemen need on the job are all at arm's reach in this compact, versatile Highway body. Designed, engineered, and Highway-built from the experience of thousands of installers and servicemen, it is scientifically arranged to place everything that the man-on-the-job needs at his finger tips. That's why this Highway IU-76 Installer's unit has become the standard of the industry.

The rear and side doors open to place at the disposal of the installer all the materials and tools he desires—drop wire reel, ladders, tree trimming equipment, wire and cords, screws, clamps, fuses, and all the other things that he must have on the job to avoid an unnecessary trip back to the shop. The workmanship on this body equals its efficient arrangement.

It has the rugged built-in strength to give years of service in all weather, on all roads.

Send today for your complete Highway catalog of public utility equipment. Or, call or visit the friendly Highway Distributor or Factory Branch nearest you.

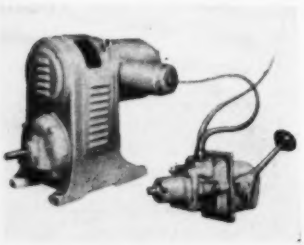
HIGHWAY TRAILER COMPANY

Headquarters: Edgerton, Wisconsin

PLANTS AT EDGERTON, WISCONSIN — STOUGHTON, WISCONSIN

The nation's largest Manufacturers of Utility Truck Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories

required. Available in full range of ratings for major auxiliary drives, including boiler feed pumps.
Allis-Chalmers Manufacturing Co, Milwaukee 1, Wisconsin.



Remote Control

This pneumatic remote control unit for variable speed motors consists of air operated plunger and an air valve. The valve may be operated by pedal, lever, cam or wheel. Operating pressure either 60 or 100 psi.
U. S. Electrical Motors Inc, Los Angeles 54, Calif.

MORE NEW PRODUCTS
about which you should know

Industrial Control Co, Wyandanch, L. I., N. Y., has a wide range speed and **torque generator** consisting of a special motor and control bar operating from 115v 60 cps. The motor speed can be varied from 100 to 10,000 rpm, with maximum output torque of 1.0 oz in. Matching gear boxes are available for any reduction ratio. Speed is read directly on a front panel meter and provisions are made to measure torque delivered to load . . . Pittsburgh Reflector Co, 408 Oliver Bldg, Pittsburgh 22, Pa has a series of square recessed **downlights** in three units—permaflector, lamp and lens—said to give maximum brightness. Entire unit is recessed into ceiling except for one-piece die-cast hinged frame. Internal baffles prevent light leakage around frame. Units are shipped packaged and wired.

Minneapolis-Honeywell Industrial Division, Philadelphia, Pa, has a **cut-off relay** for end-point temperature control for processes requiring automatic shutdown and manual resetting. The relay operates with an electric

MAGNET WIRE

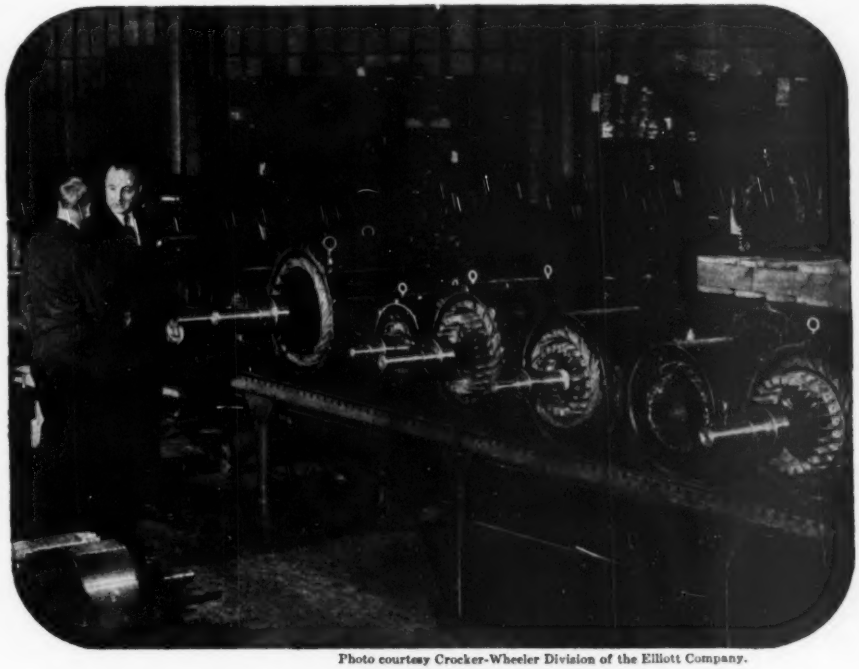


Photo courtesy Crocker-Wheeler Division of the Elliott Company.

Roevar...you can't buy a finer magnet wire

CONTINUAL IMPROVEMENT is a distinguishing feature of Roebling's electrical wire and cable line. And to make Roebling Roevar Magnet Wire today's A-1 specification for high speed winding, we use the toughest insulation we know of.

This Roevar insulation is *many times* more abrasion-resistant than conventional enamels. It is highly resilient . . . bends to a remarkable degree without cracking or coming loose from the conductor. On top of that, it has extra resistance to the solvents that are used in coil-treating varnishes and to all usual baking temperatures.

Roevar Magnet Wire comes in sizes No. 14 to 40 A.W.G. . . . and its small diameter is an important factor in many applications. You can depend on us for the best deliveries possible under today's conditions. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREEDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. & 120 S. HEWITT ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH 1301 CLARK BLDG. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

AVAILABLE in 2400 volts

with R T & E's
EXTERNALLY OPERATED TAP CHANGER

just a TWIST of the WRIST CHANGES TAPS

IN STOCK – AVAILABLE FOR IMMEDIATE SHIPMENT
WRITE FOR SIZES AND PRICES

EXTERNAL TAP CHANGERS are standard on all sizes at no additional charge – Eliminates opening tank to change taps – Marked for convenience and tap position.

632 N. 8TH ST. MILWAUKEE 3, WISCONSIN

R T & E Co.

BRANCH PLANT: WAUKESHA, WISCONSIN

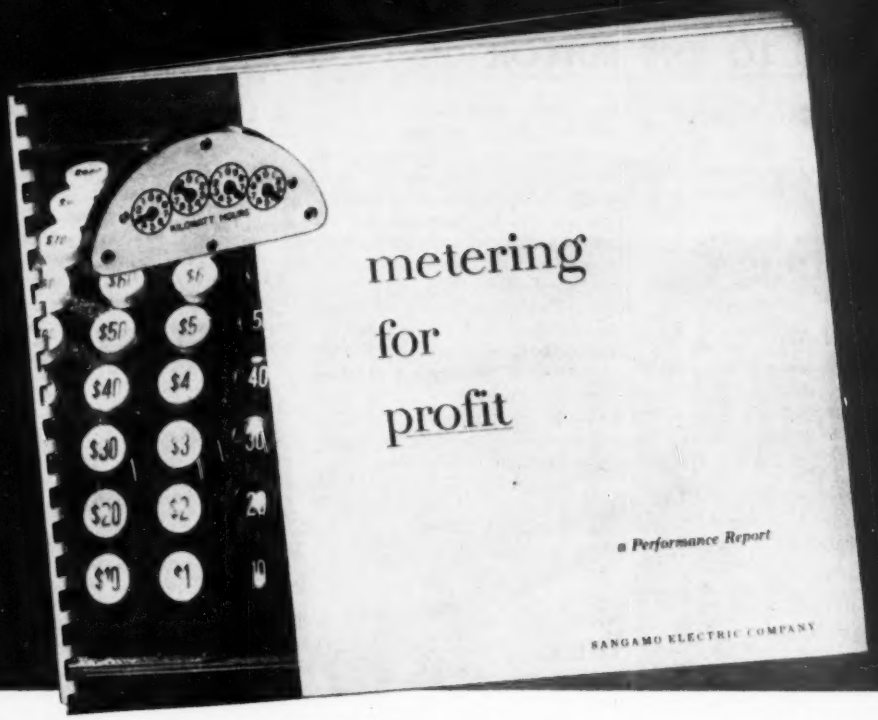
temperature or pressure controller and a solenoid or motor-operated valve. Capacity is 13 amp at 115 v, 6.5 amp at 230 v. Measures 5½ x 4⅞ x 2⅝ in. . . . Beckman Instruments Inc., Richmond, Calif, has the Model 556 Berkeley **EPUT** (events per unit time) **meter** counting from 20 to 100,000 events per sec. The counting interval is 1 sec. Any optical, physical or electrical occurrences can be translated into voltage and defined directly through the EPUT meter. Operates from 117 v, 60 cps at 100-w input.

Miskella Infra-Red Co, Cleveland 4, Ohio, has infra-red **heat panels** for baking enamel on metal at 300F. Heat distribution is 1200w per sq. ft. Load is 115v, 1,500w from 12 125-w lamps . . . Photoswitch Inc, Cambridge 42, Mass, has a general purpose industrial **photoelectric control** for counting, conveyor control, inspection, safeguards, etc. Series 20 and 21 controls provide continuous instantaneous free operation under high ambient temperature and humidity.

Olin Industries Inc, New York, N Y, has a **hand lantern** designed for flood and searchlight uses. Beam range is said to be 1,200 ft. Lamp uses standard (No 4812) railroad type battery . . . Westinghouse Elec Corp, Pittsburgh 30, Pa, has a bare lamp **luminaire** series, Type BB, for general lighting, using two 40-w standard or two 38-w, 58-w, 78-w slimline fluorescents.

Chicago Wheel & Mfg Co, Chicago, Ill, has small commercial mounted wheel or **abrasive point** ⅛-in dia, for grinding small holes in precision applications . . . Pearson Industries, Chicago 40, Ill, has a non-metallic perforated **material** called Fiberak, comparable to laminated plastics or vulcanized fibre. Obtainable in range of perforating patterns and colors, in gauges 0.01 to 0.125 in, sheets 40 x 21 to 44 x 60 in.

Anco Instrument Division, Chicago 24, Ill, has a portable **electronic stethescope** for locating friction noises. A metal probe serves as a microphone, and noise impulses are amplified to the headphone . . . Galvanic Products Corp, Valley Stream, N Y, has a selenium rectifier **tester,** Model 100A for testing forward resistance, reverse leakage current, opens and shorts, for selenium stacks rated 10 to 1,000 ma.



What would YOU like to know about metering?

Would you like to know what makes OUTDOOR METERING possible?

Sangamo J Meters are fully and precisely compensated for all temperature extremes . . . They are designed to maintain the proper physical relationships of all parts under all conditions of temperature and vibration . . . They are constructed of corrosion-resistant materials and are furnished with specially heat-treated glass covers.

Would you like to know how HIGH BILL COMPLAINTS can be reduced?

Damping magnets control the speed of the meter. Accuracy depends on the permanence of their strength. Millions of J Meters equipped with Alnico magnets have been in operation for years without a report of a single one of them speeding up in service due to loss of damping strength.

Would you like to know what QUALITY CONTROL means to you?

Sangamo's statistical quality control insures accurate and uniform performance. Control techniques —like examining production samples . . . testing those samples . . . and checking critical dimensions assure uniform accuracy. Service records from the field are also studied and evaluated—you can read the full story in "Metering for Profit."

Would you like to know why meters can operate for years with SUSTAINED ACCURACY?

Sustained high accuracy is no accident. Liberally designed potential and current elements combine to insure accurate registration from the lightest loads to loads well over four times the nominal current rating. Other important electrical and mechanical features embody the desired characteristics in all Sangamo J Meters.

Meters are important to everybody in the Electric Utility Industry—not only because they are the operating components through which every cent of revenue is measured—but, because modern meters can help the industry obtain the maximum benefits in "Metering for Profit."

Would you like to know how modern meters can promote good public relations?

Would you like to know how accurate meters facilitate fair pricing? How dependable meters can reduce operating costs? And, how well-designed meters save operating and maintenance expense for your company?

If you are interested in the answers to these, and many other questions, get your copy of "Metering for Profit." It's yours for the asking.

SANGAMO ELECTRIC COMPANY, Springfield, Illinois

Please send my free copy of "Metering for Profit"

Your Name_____

Title_____

Company_____

City and Zone_____ State_____

SM 52-12

LETTERS TO THE EDITOR

Metal Locator Wanted

To the Editor:

A customer of ours recently lost an outboard motor in the Claytor reservoir adjoining our Claytor Hydro Electric Plant and has asked if we could find out where he could obtain a simple magnetic detector which he could use in an effort to locate it.

He has the facilities to build a detector if he could secure sufficient technical description and information including a drawing or sketch. If there is a simple inexpensive detector on the market, he would like to know the name and address of the manufacturer or sales agent.

Any information that you could furnish us regarding an instrument of the above description will be appreciated.

A. L. Wellford, Jr.
Division Engineer
Appalachian Electric Power Co
Bluefield, West Virginia

• Can anyone help Reader Wellford?

Corrections by TVA

To the Editor:

The very interesting schedule of new electric generating facilities to be installed in 1952-1955, appearing in the Sept 22, 1952, issue of Electrical World, has just come to my attention. I should like to correct a possible misinterpretation of the tabulation under "Tennessee Valley Authority" on page 129.

The list includes certain plants which, while electrically part of the TVA system, are owned and operated by others. These are the Wolf Creek, Old Hickory, and Dale Hollow projects in the Cumberland River basin, and the Bear Creek, Cedar Cliff, and Tennessee Creek projects shown in the table as being on the French Broad River.

The Cumberland basin projects are being constructed and will be owned and operated by the Corps of Engineers, Department of the Army. TVA has contracted to market the power from the Wolf Creek and Dale Hollow Dams, and is also expected to market the output of Old Hickory.

The Bear Creek, Cedar Cliff, and Tennessee Creek projects are not in the French Broad River watershed, but rather in the Little Tennessee River basin. They are being built and will be operated by the Nantahala Power and Light Co, a subsidiary of the Aluminum Co of America. Under the Fontana Agreement between Alcoa and TVA, these projects will operate in coordination with the TVA system, with the energy available for the Company's use.

Incidentally, the listing of "Paducah; Swanne, Ala." suffers from several typographical errors. The plant referred to is actually our Shawnee Steam Plant which is being built near Paducah, Kentucky, in connection with service to the new Atomic Energy Commission's installation there.

G. O. Wessenauer
Manager of Power
Tennessee Valley Authority
Chattanooga, Tennessee

More Wiring

To the Editor:

I have just read the editorial, Some Wiring—More Wiring, in the current issue of Electrical World. It is a splendid job and you are to be congratulated.

We will have to find a way to get this story of more wiring up to the busy utility, manufacturer, distributor, etc. Somebody will **have** to find that way.

John C. Waddell
Managing Director
Electric Institute of Boston, Inc.
Boston, Mass.

• We understand that Mr Waddell's suggestion is being followed by wider distribution of the editorial through the National Adequate Wiring Bureau.

The Supervisor's Role

Under this general title Electrical World will run in its Nov. 17 issue a 24-page feature. Written by seven utility men who specialize in the field of industrial relations, the articles will be of value to all electric companies who wish to educate supervisors on the position they must play on the management team and how they can play that position better.

A Lot of Orange Juice

To the Editor:

There is no error in the statement that Louisiana produces the world's finest oranges. It is only natural that Mr Gillmore never heard of the famous Louisiana oranges (Letters to the Editor, Oct. 6). He is a resident of Florida, one of the three states that prohibit the importation of Louisiana citrus fruit. Louisiana has no such law—we're not afraid of comparisons.

About 60 miles south of America's Most Interesting City, there is an orange producing region that commenced the production of oranges some 250 years ago when Jesuit priests brought seeds from Spain and Italy. Some trees have been known to bear as long as 150 years. Trees untended often yield seedless, juice-filled navels that grow as large as three pounds each, and it isn't necessary to add color to give them that golden tint. Lemons grow six times their normal size—in fact, the largest operator stopped growing them because their huge size made them too difficult to market. In quality, the oranges are an absolute unequivocal "first."

But quantity is another matter. There are only some 500,000 boxes available each year. The crop is small compared to Arizona, California, and Florida and there's not much the growers can do to increase their yields as they're limited by the size of the peninsula on which the oranges grow. The peninsula, which was formed by the Mighty Mississippi, is in some places only four or five acres wide—and it's hemmed in by salt water. The production could expand only in one direction, toward New Orleans, and that land area, too, is limited. So Arizona, California, and Florida need not worry about being deprived of their markets—when it comes to quantity.

We'd be delighted to ship Mr Gillmore a crate and let him be the judge of quality, but we can't legally do so. Perhaps it's better that we can't. Mr Gillmore would never again be satisfied with his Florida oranges.

O. K. LeBlanc
Sales Promotion and
Advertising Manager
Louisiana Power & Light Co
New Orleans 14, Louisiana

• This should drown Floridians in their own juice.

now it's *Nepconol*

Formerly NE'on, *Nepconol* is the new trade name for National Electric's superior building wires and cables for general use in wet or dry locations. Nepconol thermoplastic insulation *resists* moisture . . . flame . . . acids . . . alkalies . . . oil . . . abrasion. Available in a wide choice of bright, permanent colors for easy identification.

All Nepconol Building Wires are clearly marked with size, type and voltage every two feet for easy identification.

Nepconol Wires and Cables exceed Underwriters' Laboratories, Inc. requirements.

Sold through leading electrical wholesalers.

EVERYTHING IN WIRING POINTS TO

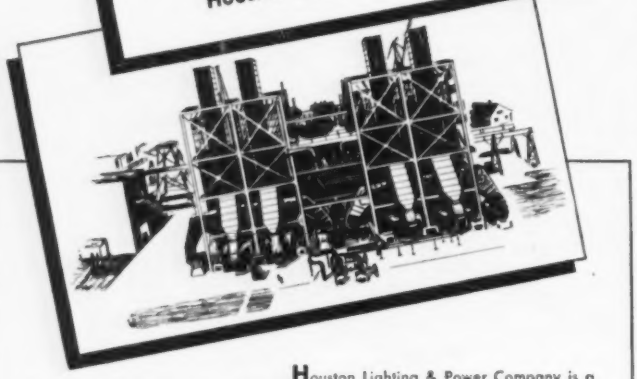
National Electric Products

PITTSBURGH, PA.

3 Plants • 7 Warehouses • 42 Sales Offices

GO on GREEN

4 Green Forced Draft Fans
4 Green Induced Draft Fans
. . . Serve the West Junction Plant of
Houston Lighting & Power Company



Houston Lighting & Power Company is a leading factor in the power field of the great southwest. That it approved the selection of Green Draft Fans by the boiler manufacturer — in this case Riley Stoker — is evidence of high acceptance in the field. No utility can afford to operate with inferior or unsuitable equipment at any point. It must have equipment that is not only highly efficient but right.

To Houston Lighting & Power can be added other well-known recently completed utilities that are Green Fan plants, among them the following:

Central Hudson Gas & Electric Co.
Atlantic City Electric Co.
Virginia Electric & Power Co.
Monongahela Power Co.
Louisiana Power & Light Co.
Kansas Gas & Electric Co.
El Paso Natural Gas Co.
Pacific Gas & Electric Co.
South Carolina Public Service Authority
Buffalo Niagara Electric Corp.

With utilities as with industrial power plants, it's safe to "Go on Green" when it comes to draft fans.

Our Catalog No. 168 tells all about Green Fans. Write for a copy.

THE GREEN Fuel Economizer COMPANY INC.
BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

WHAT THEY'RE SAYING

At Industry's Meetings

Tomorrow's Farmer

W. D. HEMKER, agricultural engineer, Westinghouse Electric Corp, before the American Society of Agricultural Engineers at Chicago, Ill.

The average American farmer of tomorrow will be an "application engineer" and even though push button farming is still a long way off we are fast approaching the time when muscle power will be almost entirely replaced by machine power. Farmers of today however must keep pace with this technological evolution if they are to become these "application engineers" of tomorrow. To accomplish this end, the farmer therefore needs a working knowledge of the basic principles of engineering.

Labor saving devices for chore work have not been developed to the extent of those for field operations but notable progress is constantly being made. Electric power is a natural for chore power, its flexibility and ease of control is one of the main factors in saving time, increasing safety and reducing operating costs in and around farm buildings.

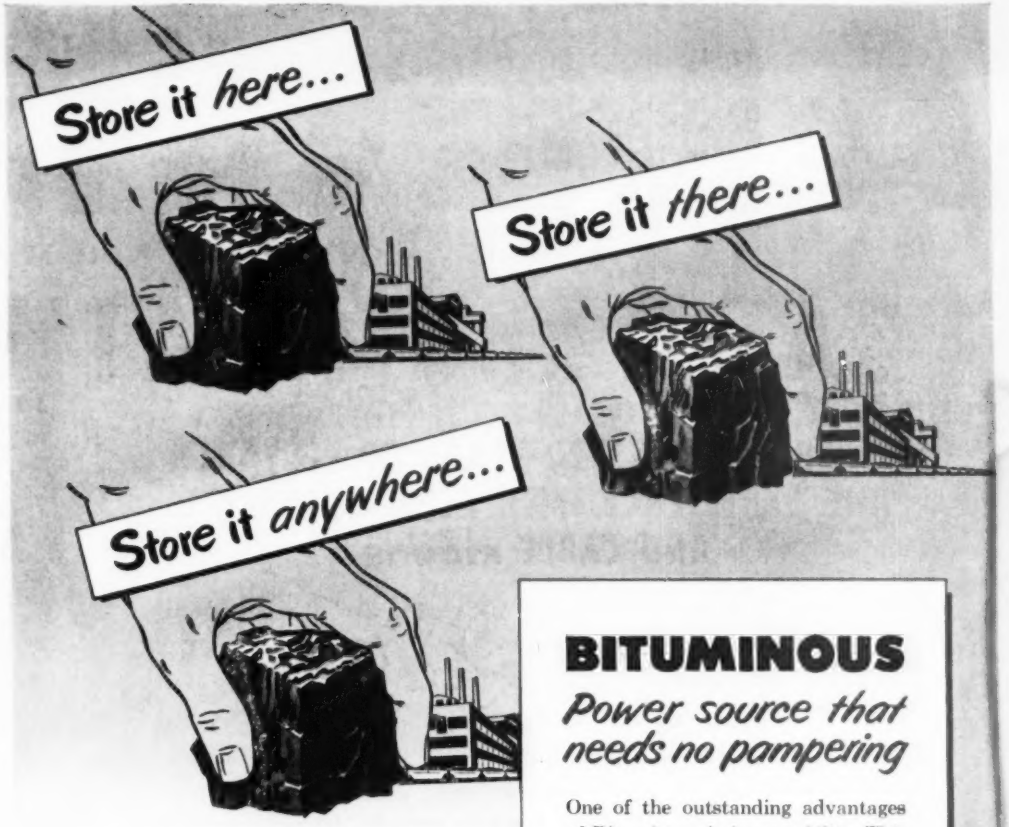
Business Problems Not Recognized by Candidates

DON G. MITCHELL, President, Sylvania Electric Products Inc, before a meeting of the Rotary Club in Chicago, Ill.

The presidential candidates thus far have not given recognition in their respective campaigns to the problems of business and industry. Mr. Eisenhower or Mr. Stevenson have never sought a place on the platform of any major convention of businessmen. In addition I have not been able to find a single instance in which either the Democratic or Republican aspirant to the presidency promised to consider businessmen's problems, many of which have their origin in Federal regulation and the manner in which they are being administered.

Isn't this rather strange when you stop to think that corporations will pay some 22 billions of dollars in taxes this year to the federal government? That these corporations will furnish 34 per cent of the total federal tax revenues?

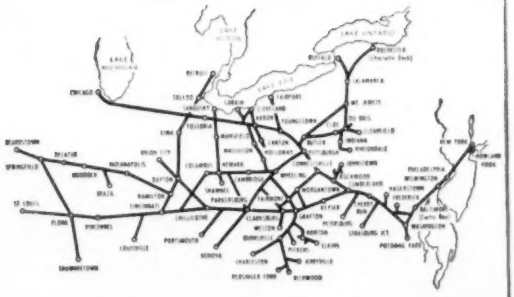
(*Continued on page* 166)



BITUMINOUS

Power source that needs no pampering

One of the outstanding advantages of Bituminous is its *storability*. This dynamic, low-cost fuel can be stockpiled anywhere—in any volume. Construction of storage facilities is not required when fuel needs increase. . Add to this the *excellence* of Bituminous mined along the Baltimore & Ohio, the wide *variety* available, and its *accessibility* through convenient transportation to industrial centers —and you have ample reason for choosing B&O coals. For helpful advice, *ask our man!*



BITUMINOUS COALS FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—better!

ALECTI

(ALUMINUM)

BARE and WEATHE

GENERAL CABLE'S 20 YEARS OF RESEARCH AND EXPERIENCE WITH ALUMINUM WIRE AND CABLE *means...*

"More Power to You"®

The General Cable line of ALECTRAL aluminum wires and cables has earned definite acceptance among engineers everywhere. Of special interest to the electrical industry is ALECTRAL-ACSR. As a bare conductor, it is most useful for transmission and rural distribution lines. With weatherproof covering, ALECTRAL-ACSR is also extremely advantageous for secondary circuits; particularly for spans where other conductors tend to sag excessively.

ALECTRAL-ACSR is but one of the many types of aluminum wires and cables produced by General Cable. For a description of the complete line and technical data, write for the new, informative booklet titled, "ALECTRAL Alumnium Wires and Cables."

GENERAL CABLE
CORPORATION

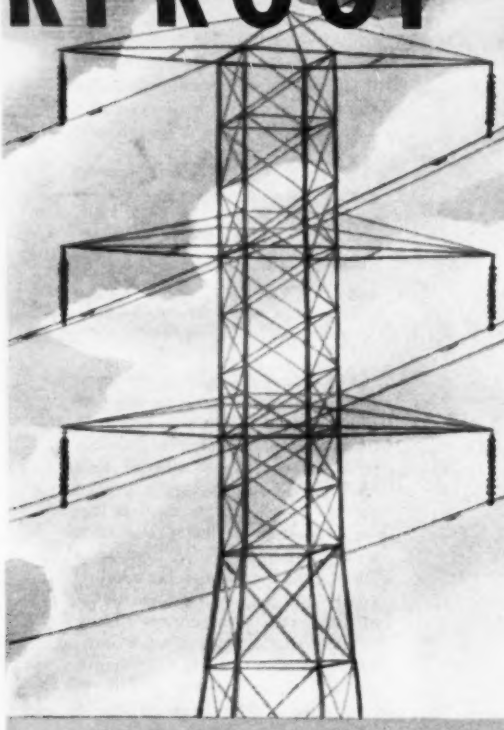
EXECUTIVE OFFICES: 420 LEXINGTON AVE., NEW YORK 17 • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

GENERAL CABLE GENERAL CABLE GENERAL CABLE

PIONEERS IN ALUM

RAL ACSR

RPROOF



ALECTRAL-ACSR

CONSTRUCTION

One, two or three layers of hard drawn aluminum wires of suitable size to give desired electrical characteristics are laid over a core of extra high strength, galvanized steel wire or strand.

WEATHERPROOF COVERINGS

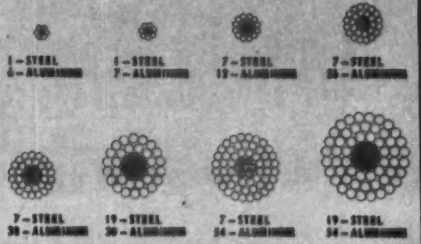
POLYETHYLENE—Of a low specific gravity, pigmented, light and heat stabilized polyethylene compound having high dielectric properties and excellent resistance to moisture and weather.

"O.K."—URC & "PEERLESS" URC—Asphalt-saturated, fibrous coverings in both double and triple-braid weights or Peerless construction.

"TIP-TOP" (Neoprene)—Tough, durable, weather-resistant, vulcanized neoprene compound. Minimum tensile sheath strength of 1600 psi.

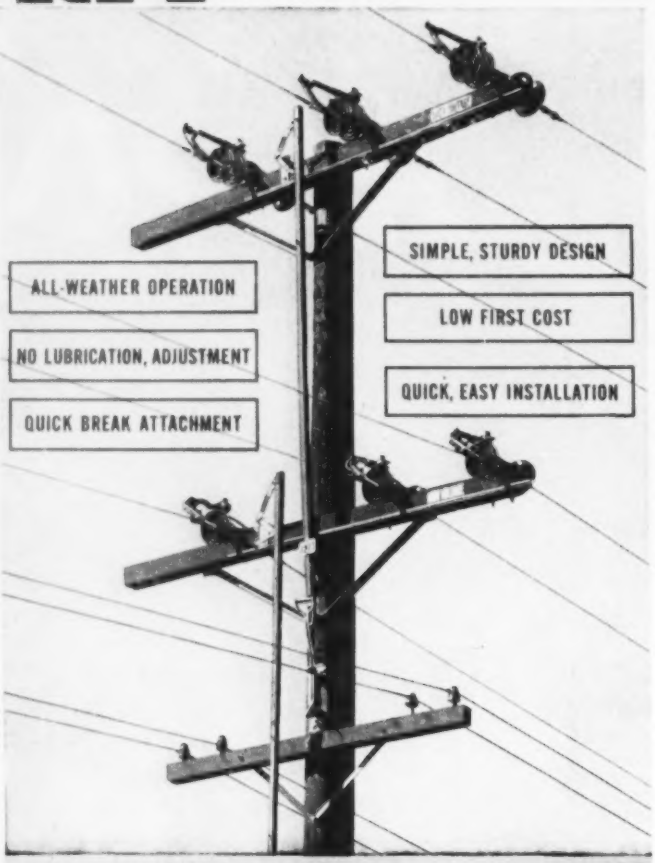
"ALECTRAL", "O.K.", "PEERLESS", AND "TIP-TOP" ARE REGISTERED TRADEMARKS OF GENERAL CABLE CORP.

TYPICAL STRANDINGS



INUM WIRE AND CABLE

KPF POLE TOP SWITCHES



MORE SWITCH FOR LESS MONEY

KPF Pole Top Switches cost less to buy and give longer service because they are simplest in design, sturdily built. They need no separate deadends, no "extra" insulators. Simple "3-step" installation saves man hours—(just bore holes in cross-arms, tighten bolts, attach connectors). Insulator stacks easily adjusted for line sag. Free-floating, self-aligning, silver-surfaced blades always maintain proper contact. Vertical, horizontal or triangular mounting. Write today for Catalog, details of KPF switches.

2504

KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton 5, Calif.

(*Continued from page* 162)

The ten things that business wants from the next president are: a more equitable distribution of the tax burden; a non-isolationist foreign trade policy; the elimination of government interference in industry-labor negotiations; an end to the regulation of profits in competitive business; honesty in government; and an international policy, rather than a "patronizing paternalistic policy."

With respect to Europe, they want less waste. In the administration of national government; a cleanup of anti-Americans in government offices; no more deficit financing; and an undertaking of and appreciation by the government of big business. Labor relations should be taken out of politics, and while business and industry are not unwilling to submit deadlocks to a third party, they just want to be sure that the umpire hasn't got a bet on the other team.

Sales Over Last Year

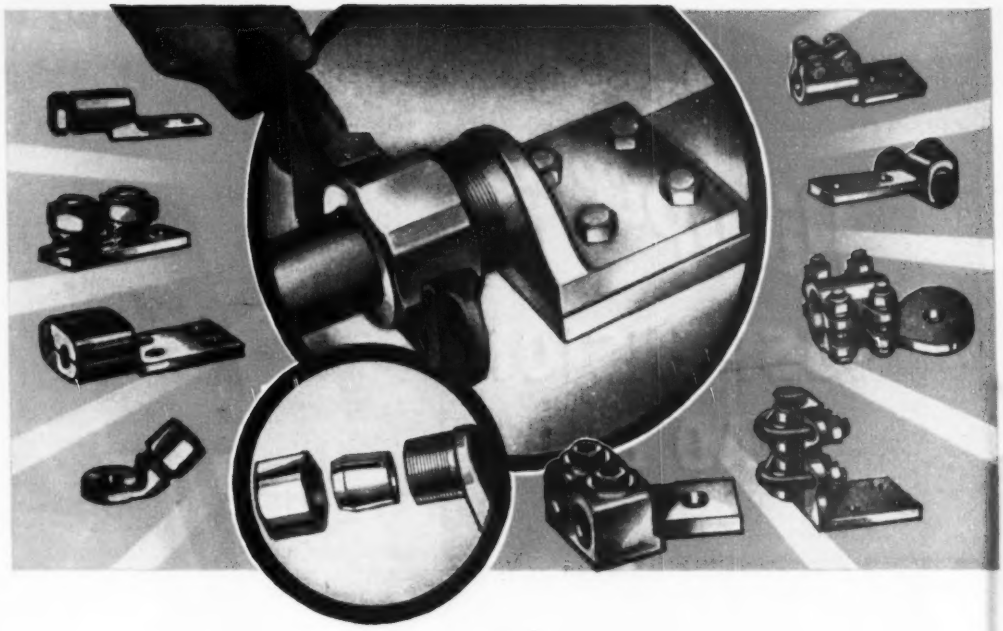
ROSS D. SIRAGUSA, president, Admiral Corporation before the New York Society of Security Analysts at New York

The increased popularity of twenty-one inch television sets is causing tube manufacturers to fall way behind in their production since they cannot produce as many twenty-one inch tubes as seventeen inchers in a given period. This is due to the fact that the production of these large units slows down mass output. Admiral's sales for the third quarter are approximately 20% higher than a year ago at the same time with earnings slightly behind a year ago due to heavy starting costs on the new line. Our fourth quarter sales and earnings should exceed those for the same period in 1951.

Electronic color television is feasible immediately but costs at the present time are much too high. One thing, however, is certain: When color television is finally released, the system that is adopted will be all electronic and compatible.

This process will permit present set owners to receive color telecasts in black and white without changing their receiver.

Although great progress has been made it will be two to four years before it can be produced in quantity and put on the market.



You always find the EXACTLY RIGHT TERMINAL—in the Complete line

Shown above, at center, is one of the various Multi-Slit Tapered Sleeve lugs in the Penn-Union catalog. You'll also find E-Z lugs with Post-and-Nut, Vi-tite, Multifit, and numerous clamp types. These pictures can merely suggest the variety.

Below are shown Thread-On, Shrink-Fit and screw types, soldering lugs, a wide selection of sheet metal terminals, etc. *Penn-Union makes the terminal you need.*

Also, Tee Connectors; Cable Taps; Straight, Parallel, Elbow and Cross Connectors; Bus Supports, Clamps, Spacers; Grounding Clamps; Service Connectors, etc.

Penn-Union fittings are the choice of leading users, who have found that *if Penn-Union made it, it's dependable*—mechanically and electrically.

Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION

Erie, Pa.

Canada: Dominion Cutout Company, Ltd.
250 Richmond St. West, Toronto

The Complete Line of Conductor Fittings

PENN-UNION

Nicopress
SUSPENSION
DEAD END
1 Faster
2 Neat streamline job when completed
3 Can be made with the same tool used in making a regular line splice
4 The exclusive features found in this Dead End make it possible for it to withstand the most severe conditions
5 Dead Ends are available for Copper, Copperweld and Steel

Nicopress
is the Registered Trade Mark of The National Telephone Supply Company

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA
Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

DONALD R. McCLUNG

E. ROBERT de LUCCIA

Donald McClung Is Promoted

Pacific P&L official is appointed executive vice president. Utility also names de Luccia chief engineer

Donald R. McClung has been named executive vice president of Pacific Power & Light Co. The utility also appointed E. Robert de Luccia vice president and chief engineer.

McClung, who has been serving as vice president in charge of physical operations since 1948, started with the company in 1917. In 1936 he was appointed assistant chief engineer.

Four years later he was made assistant general superintendent and in 1947 was promoted to the post of general superintendent. He assumed additional duties as assistant to the president in 1950. McClung resumed his duties with Pacific P&L earlier this year after serving as director of Materials and Equipment Division of Defense Electric Power Administration.

Supervised Yale Project . . . The new chief engineer joined the utility in 1951 to supervise construction of Pacific P&L's 108,000-kw Yale hydroelectric project, which is scheduled to go on the line this month. Before assuming his new duties de Luccia served during the past year as vice president in charge of the company's Lewis River development program.

Before joining Pacific P&L, de Luccia was chief of the Federal Power Commission's Bureau of Power. He started with FPC in 1938 and organized the Bureau of Power on his return from Army service in 1945. Previously he worked for Stone & Webster Engineering Corp and the Army Corps of Engineers.

U. S. Delegate . . . De Luccia was a member of the U. S. delegation at several international conferences in Europe and Canada. He served as one of three negotiators for the U. S. in developing a treaty with Canada concerning division of water at Niagara Falls for power production.

He has represented FPC on the Inter-Agency River Basin Committee and has served as a consultant on power plants for Economic Cooperation Administration. He has also represented this country at international power conferences in Stockholm, Paris, London, and Lake Success.

G. L. Furr Is Appointed Vice President of AEPCo

G. L. Furr has been appointed vice president and general manager of Appalachian Electric Power Co. Furr succeeds M. C. Funk as operating head of the company.

Funk, who will continue as vice president and director, will now devote the major portion of his time to general policy matters for AEPCo and a few other associated companies of the American Gas & Electric System.

Furr, assistant general manager of the utility since 1946, joined Appalachian at Bluefield (W. Va.) in 1916. Since then he has served in many operating capacities in the company, including operating engineer,

AEIC Elects Whiting President

Newly elected president of the Association of Edison Illuminating Companies is Justin R. Whiting, board chairman of Consumers Power Co. Whiting (left) is congratulated by retiring Pres P. H. McCance, Duquesne Light Co. Onlookers are new Vice President G. W. Van Derzee, (center) Wisconsin Electric Power Co, and F. V. Magalhaes, the asociation's secretary-treasurer.

317 REASONS WHY ... you'll benefit by attending the

20th NATIONAL POWER SHOW

National Exposition of
Power & Mechanical Engineering
Grand Central Palace, New York
Dec. 1-6

Cost-saving ideas were never more important than now and the POWER SHOW is chock full of ideas you can use. In no other way ... at no other place ... in so little time ... can you get so much help with your problems and future plans involving production, distribution and use of power. *YOU'LL SEE* the newest developments in the displays of over 300 manufacturers ... GET the expert advice of their technical representatives on products such as these:

ABRASIVES • ACID RESISTING MATERIALS • ACCUMULATORS • ACOUSTICS • AFTER-COOLERS • AIR CONDITIONING APPARATUS • AIR FILTERS • AIR SEPARATORS • AIR TESTING INSTRUMENTS • AIR WASHERS • ALARMS • ALLOYS • ALTERNATORS • ASBESTOS PRODUCTS • ASH HANDLING EQUIPMENT • AUTOMATIC PUMPING CONTROL EQUIPMENT • AUTOMATIC WEIGHING MACHINERY • BAFFLE WALLS • BAFFLES—MONOLITHIC • BAROMETERS • BEARINGS • BELLOWS • BELT DRESSING • BELT DRIVES • BELT FASTENERS • BELT HOOKS • BELT LACING • BELTING • BLOCKS • BLOWERS • BOILER COATING • BOILER COMPOUND • BOILER COVERING • BOILER SETTING • BOILER SUPPLIES • BOILER TUBES • BOILER WATER TREATMENT • BOILERS • BOLTS • BOOKS • BRASS • BRIECHINGS • BRICK—FIRE • BRICK—INSULATING • BUCKETS • BUILDING MATERIALS • BUNKERS—COAL • BURNERS • BUSHINGS • CALORIMETERS • CASTERS • CASTINGS • CEMENT • CEMENT—FIREBRICK • CENTRIFUGALS • CHAIN BLOCKS • CHAIN DRIVES • CHAIN HOISTS • CHAINS • CHUTES • CIRCUIT BREAKERS • CLARIFIERS • CLASSIFIERS • CLEANERS • CLEANING COMPOUNDS • CLOTH • CLUTCHES—FRICTION • CLUTCHES—MAGNETIC • COAL CRUSHERS • COAL HANDLING EQUIPMENT • COAL PREPARATION MACHINERY • COATINGS • COCKS • COILS • COMBUSTION CONTROL SYSTEMS • CO_2 RECORDERS • COMPRESSED AIR CONDITIONING EQUIPMENT • COMPRESSORS—AIR • CONDENSER TUBES • CONDENSERS • CONDUITS • CONTACTORS • CONTROL SYSTEMS • CONTROLLERS—ELECTRIC • CONTROLS • CONVEYORS • COOLERS • COOLING TOWERS • COPPER & CORK • COUNTERS—REVOLUTION • COUPLINGS • CRUSHERS • CUTTING MACHINES • CYLINDERS • DEHUMIDIFIERS • DESUPERHEATERS • DISCS • DRAFT EQUIPMENT • DRIVES • DRYERS • DRYING AND PROCESSING EQUIPMENT • DUCTS • DUST COLLECTORS • ECONOMIZERS • EJECTORS • ELECTRIC GENERATING SETS • ELECTRICAL EQUIPMENT • ELEVATORS • ELIMINATORS • ENGINEERING CONSTRUCTION • ENGINEERING SUPPLIES • ENGINEERS • ENGINES • EVAPORATORS • EXHAUST HEADS • EXHAUSTERS • EXPANSION JOINTS • EXTRACTORS • FANS • FEED SYSTEMS • FEED WATER TREATMENT • FEEDS • FELT • FILES AND RASPS • FILTERS • FIRE EXTINGUISHERS • FITTINGS • FLANGES • FLOATS • FLOOR MACHINES • FLOOR PLATES • FLOOR STANDS • FLOORING • FLOW METERS • FLUE GAS ANALYSIS EQUIPMENT • FORGINGS • FUEL BURNING SYSTEMS • FUEL OIL SYSTEMS • FURNACE ARCHES • FURNACE FIRE OBSERVATION WINDOWS & INSPECTOR DOORS • FURNACE LININGS • FURNACE WALLS • FURNACES • FUSES • GAS APPLIANCES • GASKETS • GATES • GAUGE GLASS ILLUMINATION • GAUGE GLASS PROTECTORS • GAUGE GLASSES • GAUGES • GEAR CUTTING MACHINE • GEARS • GENERATORS • GOVERNORS • GRATES • GREASING SYSTEMS • GREASES • GRINDING MACHINERY • HANGERS • HEADERS • HEAT EXCHANGERS • HEATERS • HEATING SYSTEMS • HOISTS • HOPPERS • HOSE • HOSPITAL & SURGICAL EQUIPMENT • HUMIDIFIERS • HYDROMETERS • ILLUMINATORS • INCINERATORS • INDICATORS • INSTRUMENTS • INSTRUMENTS OF PRECISION • INSULATION • JOINTS • KILNS • LAMPS • LUBRICANTS • LUBRICATORS • MACHINE TOOLS • MACHINE WORK • MAGNESIA • MAGNETS • MATERIALS HANDLING • METAL SPRAYING • METALLIC PACKING • METALS • METERS • MIXERS • MOTOR DRIVES • MOTORS • NIBBLING MACHINES • NOISE & VIBRATION INSULATION • NOZZLES • NUTS • OIL BURNERS • OIL-BURNING DEVICES & SYSTEMS • OIL FILTERS • OIL SEPARATORS • OIL SYSTEMS • OILS & GREASES • PACKING • PAINT • PANEL BOARDS • PAPER • PETROLEUM PRODUCTS • PIPE • PIPE BENDING • PIPE CLEANERS • PIPE COILS • PIPE COUPLINGS • PIPE COVERING • PIPE CUTTERS • PIPE FITTINGS • PIPE FLANGES • PIPE HANGERS • PIPE HEADERS • PIPE JOINTS • PIPE TOOLS & MACHINES • PLATFORMS • PLUGS • POWER PLANT SPECIALTIES • PRECIPITATORS • PRIMEMETERS • PRODUCTION MACHINES • PROTECTIVE COATINGS • PUBLICATIONS • PULLERS • PULLEYS • PULVERIZED COAL EQUIPMENT • PUMPS • PURIFIERS • PYROMETER PROTECTIVE TUBES • PYROMETERS • RACKS • RADIATORS • RECORDERS • RECTIFIERS • REFRACTORIES • REFRIGERATING MACHINERY • REGULATORS • REPAIR WORK • ROLLERS • ROOFING • RUBBER GOODS • SAFETY DEVICES • SAWS • SCALES • SCREENS AND MACHINERY • SEPARATORS • SHAFT HANGERS • SIGNALING EQUIPMENT • SILENCERS • SOOT CLEANERS • SOUND DEADENING • SPEED REDUCERS • SPRAY NOZZLES • SPRAY PONDS • SPRAYERS • SPRINKLERS • SPROCKETS • STACKS • STAIR TREADS • STEAM SEPARATORS • STEAM SPECIALTIES • STEEL PLATE CONSTRUCTION • STILLS • STOKERS • STRAINERS • SUPERHEATERS • SWITCHBOARDS • SWITCHES • TACHOMETERS • TANKS • TEMPERATURE CONTROLS • TESTING MACHINES • THERMOMETERS • THERMOSTATS • TIME CLOCKS • TIMERS • TOOLS • TORCHES • TRANSFORMERS • TRANSMISSIONS • TRAPS • TRUCKS & TRACTORS • TUBE CLEANERS • TUBES • TURBINES • TURBO BLOWERS • UNIONS • VACUUM CLEANERS • VALVE CONTROL • VALVES • VENTS • VIBRATION ELIMINATION • VIBRATION ISOLATION • VISES • WALLS • WASHERS • WATER COLUMNS • WATER FILTERS • WATER GAUGES • WATER HEATERS • WATER PURIFYING APPARATUS • WATER SOFTENERS • WATER TREATING CHEMICALS • WEIGH LARRIES • WELDING • WELDING RODS • WINCHES • WOODWORKING MACHINERY • WRENCHES

DON'T MISS THE POWER SHOW

ASME Auspices in conjunction with Annual Meeting
MANAGEMENT: INTERNATIONAL EXPOSITION CO

G. L. FURR

division superintendent, and manager of the Bluefield Division.

Funk, who has been vice president and general manager of Appalachian since 1943, completed 40 years of utility service this October. He entered the field at Sprigg, W. Va., in 1912. He served as construction superintendent and manager of Tug River Power Co and later as manager of the Kentucky & West Virginia Power Co. In 1938 he was named vice president and general manager of Kentucky & West Virginia, a position he held until he went to AEPCo.

Arkansas P&L Elevates Tuohey to a New Post

J. F. Tuohey, director of Arkansas Power & Light Co's industrial and area development department, has been promoted to the newly created position of general sales manager.

Tuohey's successor is W. H.

J. F. TUOHEY

You could know the plant . . . 20 years of steady growth . . . 20 years of work, brains and money . . . then in 20 minutes a little fire got away and reduced it all to nothing.

But, your larger size fire hazards can be protected very efficiently at a reasonable cost, thanks to C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing Systems. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area . . . to flammable liquids, electrical equipment, storage spaces, manufacturing processes and record vaults. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Flexibility is the keynote with these C-O-TWO Fire Extinguishing Systems . . . the low pressure carbon dioxide storage tanks range in capacities from one to fifty tons . . . discharge facilities can either be manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs. Future plant expansion is easily and economically provided for by initially installing an oversized low pressure carbon dioxide storage tank and adding the supplementary discharge facilities at a later date.

Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

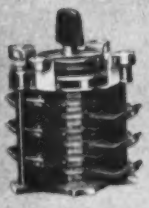
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

ROTARY SWITCHES

For every control, tap, and transfer application.

TYPE JR

TYPE A



TYPE P, 30A

TANDEM TYPE P, 30-10A

TYPE JF

- Save valuable panel space
- Simplify control of complex circuits
- Give "dead-front" mounting safety
- Listed by Underwriters Labs, Inc.
- Can be furnished to latest Navy specs.
- Ratings from 2 amperes to 200 amperes, 30 to 250 volts d. c., and 125 to 500 volts a. c. — depending on number of circuits and nature of load.

Write for combined catalog giving useful design data on Esco rotary switches.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass

Kennedy, who has served as assistant director of the development department for the past year.

Tuohey started with the company in 1931 as a substation operator and worked as a meter man, clerk, and engineer before being promoted to the sales department in 1937. He served as commercial and residential sales manager and was sales promotion manager when he entered the armed forces in 1942. He has directed Arkansas P&L's industrial and area development program since 1946.

Kennedy first worked with the utility in the rate department from 1935 through 1938. After serving with the Marine Corps during World War II, Kennedy went back to Arkansas P&L in 1947 as a community development counselor.

WALTER L. SMITH

Chase Brass & Copper Appoints Smith a VP

Walter L. Smith has been named vice president in charge of operations and director of Chase Brass & Copper Co, Inc, Waterbury, Conn.

Smith, who has been works manager for the Chase Metal Works at Waterbury since 1946, joined the company in 1915. He was made superintendent of the Chase Tube Mill in 1928 and two years later was transferred to the Cleveland Mills as mill superintendent. He was named plant manager at Cleveland in 1936.

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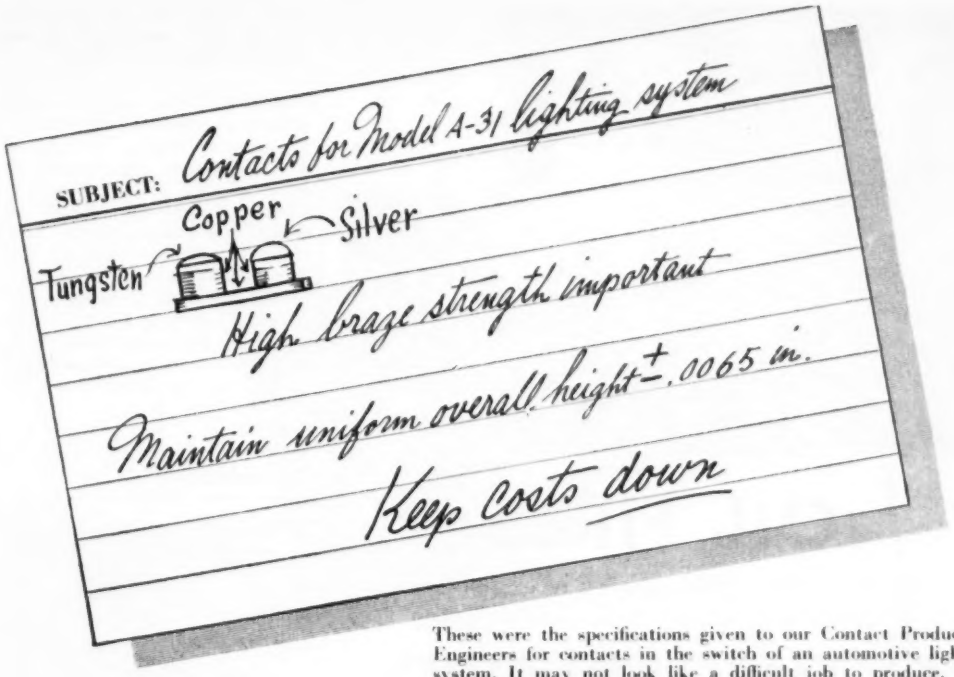
Harold A. Jones has been appointed to the newly created position of manager of the technical information center of Motorola, Inc. In his new post Jones will direct the production and distribution of all technical publica-



These were the specifications given to our Contact Production Engineers for contacts in the switch of an automotive lighting system. It may not look like a difficult job to produce. But, tungsten is hard and brittle and must be carefully ground to shape. Silver is soft and ductile . . . difficult to machine without "tearing". Brazing materials for silver and tungsten are not the same.

These were just a few of the problems involved in this particular job that were solved by Mallory production techniques. For example: new tungsten grinding equipment was designed, new brazing techniques were developed and the silver contact point was fabricated without machining. As a result, dimensions were held to the specified accuracy . . . the required high braze strength was achieved . . . the entire job was mass produced, uniformly and at low cost.

This is another example of how Mallory contact design and production experience, backed by specialized plant facilities, worked out the answer to a specific problem. Regardless of the requirements of your electrical contacts, Mallory can produce them to the highest quality standards . . . at the right price.

Expect more...
Get more
from **MALLORY**

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

Electrical Contacts and Contact Assemblies

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MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

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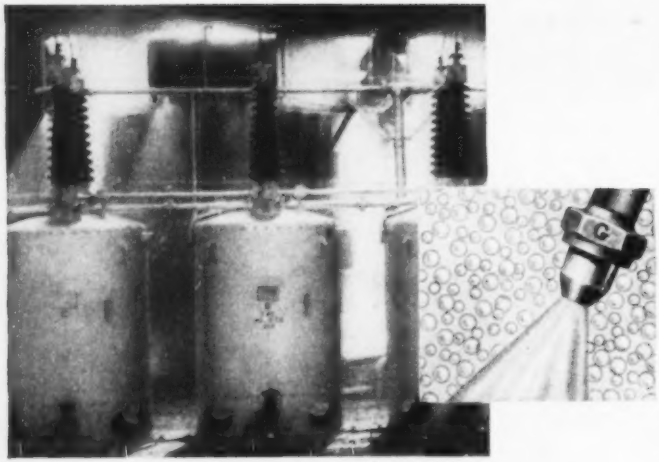


OIL FIRES

From our files . . . facts about 3 typical oil fires which Grinnell Mulsifyre System quickly, safely

EXTINGUISHED

Complete extinguishment of fires within areas protected with Grinnell Mulsifyre sprays is usually obtained in a matter of a few seconds after the water discharge starts. Case histories prove that Mulsifyre projectors are effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. In these oils the surface emulsion remains to give after-protection against flashback.

Avoid future trouble from fire. Check the facts below on the reliable way Grinnell emulsion-forming spray systems operate. Then communicate with Grinnell Company Inc., Providence, R. I. or with one of the branch offices located in principal cities.

The record speaks for itself . . .

1. This is a case of a bank of three 12,500 KVA single phase transformers, oil insulated and water cooled. An arc flashed below the oil surface from low voltage leads to the iron core. Relief diaphragm ruptured, forcing out oil whose vapors ignited. Automatically operated Mulsifyre System extinguished the fire before it could damage adjacent transformers.

2. Here's another instance . . . drizzle-wetted coal dust, streaking on an insulator, caused a flash-over which ignited an oil spill. Manual operation of a gate valve turned on the fixed Mulsifyre System, extinguishing the fire.

3. And another! Repeated operations of automatic circuit breakers due to severe electric storm caused oil spray and spillage which was ignited by flames coming from tanks through explosion vents. The explosion blew out three outside brick walls of switch room. The Mulsifyre fire protection system went into action and it extinguished the resultant fire.

GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

tions covering the sales promotion, sales training, public relations, and service activities of the division.

Clifford L. Rowley has been named manager of Owens-Corning Fiberglas Corp's new Battery and Process Products Division. The company also appointed **W. Whitney Kuenn** as manager of its newly established Air Conditioning Products Division. Rowley, who has been associated with Owens-Corning since its organization in 1938, has served as manager of the Air Conditioning and Battery Division since 1949. Kuenn, with Owens-Corning since 1943, has headed appliance sales for the firm for the past four years.

OBITUARY

Robert E. Dillon

Robert E. Dillon, 68, vice president and assistant to the president of Boston Edison Co, died at Cambridge, Mass., Oct. 17.

A native of North Attleboro, Mass., Dillon was educated at the Massachusetts Institute of Technology. He joined Boston Edison in 1911, starting in its laboratory and testing branch. He was then transferred to the production department, becoming assistant superintendent in 1917 and superintendent in 1925. In 1937 Dillon was appointed vice president in charge of production and engineering activities and five years later was made a director.

Internationally recognized as an authority on generating plant construction and operation, Dillon in 1946 had served as a delegate to the World Power Congress in Paris.

Electrical Contractors!

Here's Your New Westinghouse
SALES AND REFERENCE KIT

Only $2.75 with famous Westinghouse Lighting Handbook.
This book alone sells for $2.00!
Without Handbook, kit costs $1.50.

Here's the book you've needed, wanted for a long time. It helps you sell. It helps you figure installations. It helps you keep up with the latest lighting developments.

The new Westinghouse Sales and Reference Kit for Electrical Contractors has direct mail campaigns for your use. It has a slide rule, a calculator, forms to layout lighting installations. It has section after section of data and specifications, information about the newest, the best types of lighting.

And for $2.75, it includes the famous Westinghouse Lighting Handbook, admitted by everyone to be the finest, the most complete lighting text in the field. Contact your local Westinghouse Lamp Sales Office or mail the coupon below.

YOU CAN BE SURE ... IF IT'S
Westinghouse

WESTINGHOUSE LAMP DIVISION
Bloomfield, New Jersey

I enclose $_____ for _____ copies of your New Westinghouse Sales and Reference Kit with Handbook ($2.75) ☐ without Handbook ($1.50) ☐

NAME _____

COMPANY _____

ADDRESS _____

STREET _____ STATE _____

HELP PUSH

We're pushing the new Westinghouse Sales and Reference Kit for Electrical Contractors through Electrical Construction and Maintenance in October, November, and December.

The more you help push this kit, the more it will help electrical contractors to increase their business, thus helping to build load in your area.

YOU CAN BE SURE ... IF IT'S
Westinghouse

Power Supplier Parley Is Set

Sponsored by Westinghouse, the conference will be held Dec. 3 in conjunction with 31st National 4-H Club Congress

Westinghouse Electric Corp has scheduled its second annual Power Supplier Conference on the 4-H Farm and Home Electric Program for Dec. 3 at the Conrad Hilton Hotel, Chicago.

The one-day conference, planned to coincide with the 31st National 4-H Club Congress, is designed to enable power suppliers to exchange ideas and discover new ways of cooperating with the 4-H Electric Program.

Conference Agenda . . . Topics scheduled for discussion include:

1. The needs of rural youth.
2. Training power company personnel to train local leaders.
3. Productive electric projects for 4-H Club members.
4. How power suppliers assist with 4-H summer camps in Ohio.
5. 4-H Electric Congress.

Panel discussions will be held on these subjects:

1. How to interest girls in the 4-H electric program.
2. State sponsorship of the 4-H Farm and Home Electric Program.

Some 1,200 4-H boys and girls will attend the congress slated for Nov. 30-Dec. 4. Theme of the congress is "Serving as Loyal Citizens Through 4-H."

Outstanding Members . . . Boys and girls attending the congress have been selected by the various state Extension Services as the outstanding 4-H Club members enrolled in the state 4-H Farm and Home Electric Programs.

This program is an Extension Service educational program designed to develop active interest in electrical methods and equipment used on farms and in the homes. Members of 4-H Club are encouraged to acquire a working knowledge and skill in the utilization of electricity, to develop specific plans for using electricity, and to demonstrate to others the use and care of electrical equipment.

Enrollment Grows . . . During the 17 years in which Westinghouse Educational Foundation has sponsored the 4-H Farm and Home Electric Program in cooperation with the Department of Agriculture and state Extension Services, enrollment has grown from 2,000 members in 1936 to some 85,000 members in 1952.

This year 400 power suppliers—175 utilities and 225 cooperatives—cooperated with the 4-H Electric Program in the various states. Power supplier cooperation falls into four types of activities:

1. Assisting the state 4-H Club staff in developing literature and program plans.
2. Sponsorship of leader training clinics or workshops.
3. Helping local 4-H Club leaders conduct club meetings on electrical subjects and demonstrating the uses of electrical equipment.
4. Giving general support and encouragement to the 4-H program. This includes providing additional awards on the county and state level to supplement awards provided on the national level.

Awards . . . Westinghouse-sponsored awards in the 4-H Electric Program consist of: Four gold medals for winners in each county, all-expense trips to the National 4-H Club Congress in Chicago for state winners, and college scholarships of $300 each for six national winners.

The Westinghouse dinner honoring the state winners in the 4-H program is set for Tuesday evening, Dec. 2.

General Electric's Sales Reach New Record Level

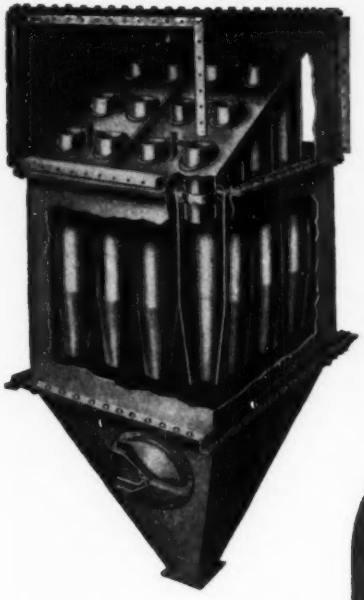
General Electric Co's sales for the first nine months of this year reached a new record level of $1,813,490,000, a 7% rise over a year ago.

Net profit for the nine months totaled $94,750,000, equal to $3.28 per share of common stock. This was an increase of 10% over the net profit for the same period of 1951 of $85,936,000, equivalent to $2.98 per share of common stock.

Sales for the third quarter of 1952 were $642,288,000 compared with $610,645,000 for the second quarter of this year and with $509,349,000 during the third quarter of 1951.

Glassblower's Art Shown at Corning

Molten glass gobs brought from fiery cubicles are rolled, blown, shaped, and coaxed into the finished object at the Corning Glass Center, Corning, New York. Members of the Illuminating Engineer Society's Committee on Aviation Lighting, which recently held a two-day technical conference at the center, witness a demonstration of the glassblower's art. Every step in the evolution of a piece of Steuben glass may be observed from galleries at the Corning Glass Center.



In dust and fly ash recovery

MULTICLONE COLLECTORS

***and only Multiclones* give vital advantages like these...**

No wonder "MULTICLONE" is the leading name in the centrifugal recovery of dust and fly ash from all types of gases, hot or cold.

No other mechanical recovery equipment has so many years of dust and fly ash recovery experience behind it... or has such uniformly high collecting efficiency... or provides so many other money-saving, space-saving advantages as MULTICLONE. The four advantages outlined below are by no means the complete MULTICLONE story, but are typical of the vital savings found *exclusively* in MULTICLONE equipment...

Uniformly High Recovery:
MULTICLONE's multiple *small diameter* tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles, but also a high percentage of the *extremely small* particles of 10 microns and less. This, coupled with the fact that there are no pads or filters to become choked with recovered material, results in a more complete recovery of *all* suspended materials from the gas stream.

Long and narrow

Square

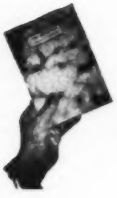
Maximum Adaptability:
In addition to its unusual compactness, the MULTICLONE is also unusually adaptable to various installation requirements. Where head room is low it can be installed with side-inlet side-outlet connections. Where side clearances are restricted, it can be installed with side-inlet top-outlet connections. In addition, without changing capacities, the shape of the unit can be varied—long and narrow, short and wide, or square—to fit restricted spaces ...and its single-inlet single-outlet duct requirements permit greater flexibility and simpler installation. These savings slice installation costs, space requirements and insulating expense.

Space-Saving Compactness:
Plant space costs money—so be sure to check space requirements carefully. As shown in the accompanying chart, the MULTICLONE requires less floor space and less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the great importance of this one MULTICLONE advantage alone!

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

Minimum Maintenance:

The MULTICLONE has no high speed moving parts to repair or replace... no pads or filters to clean or renew... nothing to choke the gas flow or increase draft losses as suspended materials are recovered. MULTICLONE draft losses remain uniformly low *at all times*. Further, the recovered material from an entire bank of tubes is collected in a *single* hopper—far easier to service and maintain than the multiple hoppers of conventional cyclone units.



FREE INFORMATIVE BOOKLET
This 32 page booklet outlines the basic principles of centrifugal dust recovery and shows the many ways MULTICLONE advantages assure higher recovery at lower overall costs. A free copy of this booklet will gladly be sent on request. Write today!

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. La SALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

One man carries a two-man load! That's one of the advantages of aluminum conduit that helps . . .

Contractor Cut Conduit Costs 30%!

Cost records maintained by the contractor for the electrical construction of a large industrial plant indicate a saving of 30 per cent through the use of Alcoa Aluminum Electrical Conduit.

Approximately 560,000 feet of aluminum conduit were used on the job. Sizes ranged from ½" to 5" in diameter. The installation involved much material handling and fabricating, usually a significant part of final costs. Major savings were effected in these categories due to the light weight of aluminum conduit (about a third that of steel) and its ease of fabrication on the job site.

For additional information on Alcoa Aluminum Electrical Conduit call the Alcoa sales office listed in your classified directory under "Aluminum." Or write direct for Alcoa's new booklet.

ALUMINUM COMPANY OF AMERICA
1936-L Gulf Building
Pittsburgh, Pennsylvania

ALCOA
ALUMINUM RIGID CONDUIT

For the first nine months provision for federal taxes totaled $173,183,000. In the same 1951 period, the tax bill was $201,249,000.

"While continued substantial increases in defense production and a good volume in apparatus lines largely accounted for the record high volume of sales in the first nine months of 1952," Pres Ralph J. Cordiner, said, "the third quarter also reflected a pick-up in volume of consumer products and industrial components."

OK's $31.8-Million Order

TOKYO (McGraw-Hill World News)—Importation of $31.8 million worth of U. S. steam power generating equipment has been given a preliminary go ahead by the Japanese Foreign Investment Council. According to announcements here, Kyushu Power Co will get equipment worth $8,580,000 from Westinghouse Electric Corp and Kansai Power Co will take $16,730,000 worth from the same company. Central Electric Power Co will buy $6.5 million worth from General Electric Co.

SALES ASSIGNMENTS

COMPANY STAFFS

Pittsburgh Reflector Co has named William J. Fetzer lighting representative for the Columbus-Cincinnati-Louisville territory. Fetzer, with headquarters in the Federal Reserve Bank Building at Cincinnati, will handle sales, engineering, and service for the entire line of Pittsburgh Permaflector fluorescent and incandescent lighting equipment.

Joseph Dixon Crucible Co, Jersey City, N. J., has appointed R. R. Huntington as sales engineer in Louisiana, Mississippi, and eastern Texas.

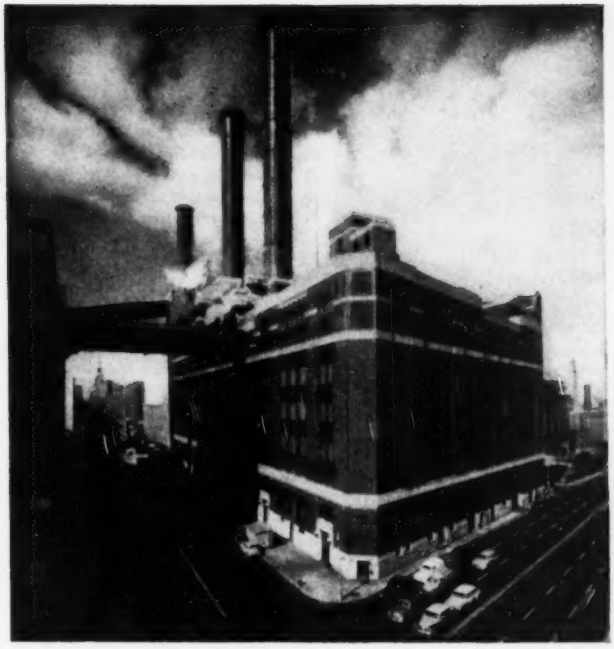
BullDog Electric Products Co, Detroit, has added Warren F. Maegli, formerly with Admiral Corp, to its Milwaukee sales staff. Raymond O. Reinhardt has joined BullDog as a field engineer and will help serve the St. Louis, Mo., area under district manager E. N. Cahoon.

REPRESENTATIVES

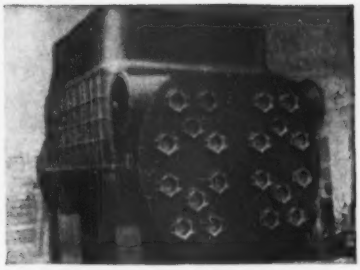
Electrical Engineers Equipment Co, Melrose Park, Ill., has appointed Smallwood-Kemp Engineering Co, 5214 Westchester St., Houston, as its representative in Texas.

Fisher-Pierce Co, Inc, Boston, has named a new sales representative to cover Alabama, Georgia, and Florida. The representative is Walter W. Wildeman, 788 Spring St., Atlanta, Ga.

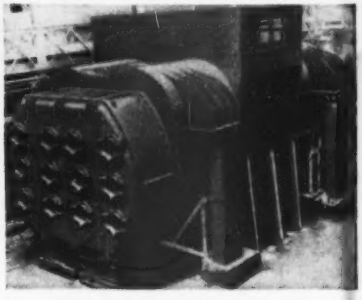
States Co, Hartford, Conn., has appointed Milton Duncan to cover the northern part of Missouri. Duncan is located at 5546 Troost Ave., Kansas City, Mo.



CON EDISON'S EAST RIVER ELECTRIC GENERATING STATION at 14th Street, New York City, will contain the new Worthington 125,000 sq-ft condenser. The shell, which is to be installed under 160,000-kw Unit No. 7, will contain nearly 105 miles of ⅝" O.D. aluminum brass tubes and will require 138,000 gpm of East River water supplied by two 54 in. Worthington "Mixflo" vertical single suction volute circulating pumps.



WORTHINGTON CONDENSER installed in 1931 to serve 160,000-kw Unit No. 7, Hudson Avenue Station. Tube sheets were drilled for 110,000 sq ft with 101,000 sq ft installed.



ONE OF TWO 74,500 SQ-FT 2-PASS WORTHINGTON CONDENSERS serving 60,000-kw Units 14 and 15 at Waterside Station No. 1.

Con Edison once again installs "largest" condenser

On several occasions over the past fifty years, Worthington has been selected to build the "world's largest" surface condensers in single shell design.

In 1919, a 70,000 sq-ft condenser was installed under a 35,000-kw turbine-generator for a prominent utility company. This was the largest single shell surface condenser of its day.

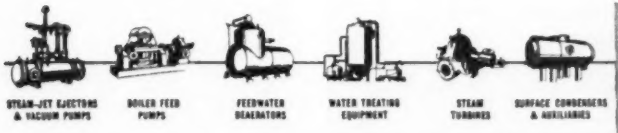
In 1931, Brooklyn Edison Company (now Consolidated Edison Company of New York, Inc.) installed, under 160,000-kw Unit No. 7 at the Hudson Avenue Station, the "world's largest" at that time, a 101,000 sq-ft single-pass Worthington condenser. This was followed, in 1949, by two 74,500 sq-ft condensers for Waterside Station No. 1.

Now, Worthington is again building for Con Edison the "world's largest" single-shell condenser ever ordered, 125,000 sq-ft, single-pass, for the 160,000-kw Unit No. 7 addition to East River Station.

Worthington, with over a century of experience in the manufacture of steam power equipment, is prepared to build efficient condensers in all sizes. Let us advise you, without obligation, on your new installation.

Write, stating requirements, to *Worthington Corporation, Steam Power Division, Harrison, New Jersey.*

Z.2.2



World's Broadest Line of Steam Power Plant Auxiliaries

WORTHINGTON

Condensers

Bridge on Wilbur Cross Parkway, Conn. Fabricated by Electric Boat

STRUCTURAL STEEL WELDMENTS

Electric Boat now has available, for subcontract or jobbing work, extensive specialized facilities for fabricating and welding structural steel sections for bridges, power line towers, etc. Our long and successful experience in this field is your assurance of high-precision craftsmanship and on-time deliveries. We will gladly give full information on request.

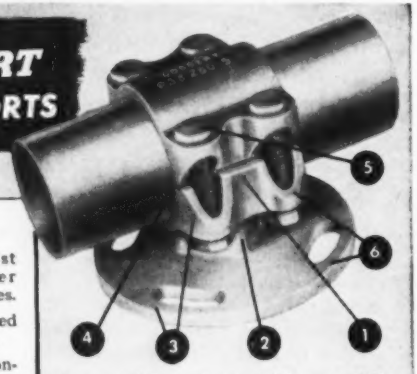
Address inquiries to:

ELECTRIC BOAT

Division of General Dynamics Corporation

Groton, Connecticut

DOSSERT BUS SUPPORTS



Type PSS

1. Designed to resist severe cantilever and impact stresses.
2. Heavy-duty, ribbed throat underbody.
3. One-piece, rigid construction.
4. Slip-fit and tight-fit by reversing cap.
5. Silicon bronze high-strength bolts...oval neck connector or hex head type.
6. High strength bronze alloy . . . non-magnetic . . . corrosion-resistant.

Write for Catalog 45-1B

Immediate Delivery of all standard items

A rugged Bus Support Clamp which permits rigid or slip-fit clamping on tubular bus conductors. Unique features make this clamp an outstanding support for trouble-free, enduring service.

Also available on specification with an 8-hole slotted base.

For use with aluminum conductors add HSN to the catalog number.

DOSSERT MFG. CORP.

369-355 HURON STREET, BROOKLYN 22, N. Y.

SINCE 1904

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt Interior, Bldg. 53, Denver Federal Center Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Roseville switchgear assemblies, Spec. DS 3823 substation, transformers, distribution board for Nimbus Power Plant, Central Valley Proj. Spec. DS 3824. L. N. McClellan, ch. engr.

Conn., Hartford—General Teleradio Inc., 1440 Broadway, New York, 36, N. Y., television station, $476,000.

Conn., Middletown—State P. Wks. Conn., State Office Bldg., Hartford, lighting system, electrical imprvs., Connecticut State Hospital. $425,000.

Fla., Miami—Storer Broadcasting Co. (WGBS), 199 Pierce St., Birmington Mich., television station, $1,250,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Fla., St. Petersburg—Pinellas Broadcasting Co. (WTSP), 440 First Ave. S., television station, $540,000.

Ga., Valdosta—WGOV-TV, Inc., Daniel Ashley Hotel, television station. $167,000 W. J. Holey, 822 N. Highland Ave. N. E. Atlanta, consult. engr.

Idaho, Nampa—Frank E. Hurt & Son, Inc. (KFXD), 1024 12 Ave. S., television station. $104,000. Grant R. Wrathall, Aptos, Calif., consult. engr.

Ill., Champaign—Midwest Television, Inc. (WDWS), 2501 S. Neil St., television station, $402,000. Paul Godley Co., Old Quarry Rd., Upper Montclair, N. J., consult. engr.

Ill., Chicago—Zenith Radio Corp. (WEFM), 6001 Dickens Ave., Chicago, Ill., television station, $564,000.

Ind., Crawfordsville—City, Municipal Light Plant, 11,500 kw generator, new boiler brick, steel plant addn., new equipment, $2,232,718.

Ind., Indianapolis—WIBC, Inc., 30 Washington St., television station, $739,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Iowa—Southwestern Power Co-operative, Creston, rural distr. line construction and general system imprvs., Union Co. $2,318,000. Stanley Eng. Co., Muscatine, consult. engr.

Kan., Kingman—City, Geo. E. Burket, mayor, power plant imprvs. $100,000, A. C. Kirkwood, 1029 E. 31 St., Kansas City, Mo., consult. engr.

Kan., Wichita—Taylor Radio & Television Corp. (KANS), 101 S.N. Broadway, television station, $816,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Ky., Lexington—American Broadcasting Corp. (WLAP) Radio Bldg., television station, $384,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Louisiana—Valley Electric Membership Corp., Natchitoches, 380 mi. rural distr. lines, sys. imprvs., Grant Co. $765,000.

La., Shreveport—International Broadcasting Corp., P.O. Box 1287 (KWKH), Commercial Bldg., television station, $832,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Me., Portland—Community Broadcasting Service, 57 State St., Bangor, television station, $290,000.

Md., Annapolis—P. Wks. Office, U. S. Naval Academy, Annapolis, transformer and switching station, U. S. Naval Radio Station, Spec. 26439. Plans deposit $10.

Mich., Detroit—City, Bd. Health, R. L. Novy, pres., 334 Bates St., BH-24a (R) alterations, incl. replacement steam turbine unit, rewind, repair generator, new exciter unit for existing 400 kw power factor, Mayburv Sanatorium. Plans deposit $10, refundable, George R. Thompson, city engr.

Mich., Flint—Booth Radio & Television Stations, Inc., (WBBC), 700 Buhl Bldg., Detroit, television station, $696,000.

Mo., Kansas City—WHB Broadcasting Co., Scarritt Bldg., television station, $1,400,000, A Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, Tex., consult. engr.

Nebraska—K.B.R. Electric Membership Corp., Ainsworth, 813 mi. rural distr. lines, Brown Co. $1,000,000. Raymond H. Reed & Co., Columbus, consult. engrs.

N. M., Roswell—John A. Barnett, Box 670, television station, $314,000. Gautney & Ray, Warner Bldg., Wash., D. C., consult. engrs.

N. Y., Rochester—WHEC, Inc., 40 Franklin St., television station, $648,000.

N. C., Sanford—Cornell-Dubilier Electric Corp., 1000 Hamilton Blvd., South Plainfield, N. J. erect large plant for mfg. capacitors on 27-acre site.

N. D., Fargo—WDAY, Inc., 118 Broadway, television station, $344,000. Gillett & Bergquist, Natl. Press Bldg., Wash., D. C., consult. engrs.

Okla., Oklahoma City—Koma, Inc. (KOMA) 228 W. Grand St., television station, $676,000. Paul Godley Co., Old Quarry Rd., Upper Montclair, N. J., consult. engrs.

Ore., Portland—Westinghouse Radio Stations, Inc., (KEX) 1625 K St., N. W. Wash., D. C., television station, $855,000.

Pa., Pittsburgh—Westinghouse Radio Stations, Inc. (KDKA) 1625 K St. N. W., Wash., D. C., television station. $1,810,000.

Tenn., Knoxville—Mountcastle Broadcasting Co., Inc. (WROL), 812 Gay St. S. W., television station, $559,000. Gillett & Bergquist, Natl. Press Bldg., Wash., D. C., consult. engrs.

Tex., Amarillo—Plains Radio Broadcasting Co. (KGNC), 8 and Harrison Sts., television station. $486,000. A. Earl Cullum, Jr., 4710 Lemmon Ave., Dallas, consult. engr.

Washington—Pacific Power & Light Co., 920 S.W. 6 St., Portland, Ore. 43 mi. transmission line from Union Gap to Grandview, Yakima Co. $1,600,000.

Wash., Yakima—Pacific Power & Light Co., 920 S.W. 6 St., 152x175 ft. warehouse and line dept. headquarters bldg. with 24x104 ft. loading dock and 40x78 ft. transformer storage platform. $190,000. J. S. Villeavik, Liberty Bldg., archt.

Wisconsin—Oconto Electric Co-operative, Oconto Falls, 43 mi. rural distr. line 29 mi. 33 kv transmission line and system imprvs., Oconto Co. $497,000.

Ont., Wallaceburg—Electric Comn., A. G. Price, mgr., Wallaceburg, substation. $125,000.

Low Bidders & Contracts Awarded

O., Vandalia—Dayton Power & Light Co., 25 N. Main St., Dayton, O. Own Forces. $300,000. Vandalia, O. Substations, 12,000 volt line from station to Allison-Aeroproducts Div. of General Motors Corp.

Tex., Big Lake—West Texas Utilities Co., Abilene, Tex., Force Account. $100,000. addnl. unit of rural pole, electric power lines.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

D. C., Wash.—Winchester Co-operative Corp., Inc., 911 15 St. N.W., plans by Shapiro, Inc., 911 15 St. N.W., apartment units, Adams Mill Rd. near Calvert St. $15,000,000.

Md., Baltimore—State Bd. P. Wks., 506 Park Ave., state office bldg. $10,000,000. Palmer, Fisher & Williams & Nes, 1020 St. Paul St., and L. P. Kooken & Assoc., 2017 Maryland Ave., Zone 18, consult. engrs.

N. Y., Syracuse—Solvay Process Div., Allied Chemical & Dye Corp., 61 Broadway, New York, Zone 6, soda ash facilities at existing plant. $10,000,000.

S. C., Charleston—South Carolina State Ports Auth., 1 Vendue Range, expansion Columbus Street Terminals. $9,000,000. Lockwood-Green Engineers, Spartanburg, consult. engrs.

Tex., Pasadena—Phillips Chemical Co., Pasadena, fertilizer plant unit. $3,086,050.

Que., Montreal—Province of Quebec, Dpt. Health, Quebec City, anti-tuberculosis vaccine clinic and 100-bed hospital, $3,000,000. Dpt. P. Wks., Quebec City, Que., engr.

MAJOR JOBS FOR QUALIFIED, YOUNG, AMBITIOUS UTILITY PERSONNEL

We have been authorized to present fully qualified candidates for the following positions:

1. ADMINISTRATIVE VICE PRESIDENT in 38-45 year age bracket. Qualified to coordinate operating, commercial, and accounting functions and administer company's organization and operations. Operating and/or engineering experience essential. Familiarity with rate case preparation and presentation, accounting, and sales promotion desirable. Preferred consideration given to those with combination experience, such as electric-gas, telephone-gas, electric-water, telephone-water. Eastern location.

   Starting salary range (dependent on qualifications) . . . $13,500-$20,000

2. VICE PRESIDENT, OPERATIONS, in 38-45 year age bracket. Qualified to assume full, final responsibility for operations, engineering, and construction. Operating and engineering experience absolute requirement; familiarity with rate analysis, labor negotiations, analysis of manpower requirements desirable. Sufficient experience, knowledge and background to handle all operating and engineering problems of diversified utilities company. Multi-utility experience essential, such as combination electric-gas, telephone-water, etc. Eastern location.

   Starting salary range (dependent on qualifications) . . . $12,000-$15,000

3. TREASURER in 35-40 year age bracket. Qualified to supervise and administer all accounting and quasi-accounting, commercial problems. Experience in utility accounting, including familiarity with F.P.C. and F.C.C. systems, and also in utility financial budgeting and use of budgetary methods for control, essential. Knowledge of systems and methods development and rate case preparation desirable. Eastern location.

   Starting salary range (dependent on qualifications) . . . $10,000-$12,500

4. GENERAL SALES MANAGER in 35-45 year age bracket. Qualified to direct, from a central administrative office, sales and load building program for geographically separated electric, gas, and telephone properties. Experience in actual selling and in building of sales forces absolute requirement. Familiarity with technical bases for competitive selling desirable. Eastern location.

   Starting salary range (dependent on qualifications) . . . . . $5,000, plus commission arrangement

Each of the above jobs is with an organization whose fundamental policy is aggressive, efficient and productive business management. General requirements are that applicants must be ambitious, hard working, and interested in a productive association, rather than in only the security of a "civil service" type position.

Successful candidates will have the philosophy that continuing personal benefit and advancement can only result from continuing achievement on behalf of the organization.

Starting salaries within the above ranges will depend upon how closely applicants meet the ideal specifications. Engagements will be premised on improvement in compensation within one year from association, if productive job is done. Pension and insurance benefits are at least competitive.

These jobs are *not* for the chronically discontent. They *are* for those who rebel against advancement based only on seniority or years of service. They *are* for those qualified in the belief that they can really achieve and want to be compensated only for their achievement. They will appeal to those whose personal development or advancement has been stymied by contrary policy. They will be for those who want the challenge —and opportunity—of responsibility.

Consideration will be given *only* to those submitting detailed history of personal experience and qualifications, which should include present compensation and compensation in all previous positions.

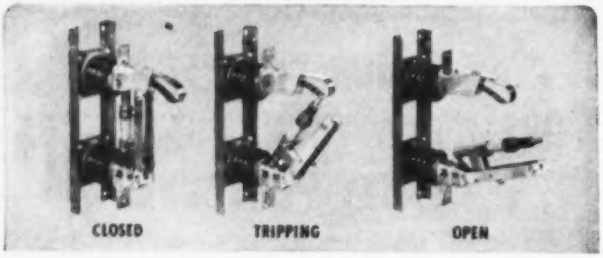
Applications should also include concrete reasons for a desire to change from present affiliation. Picture optional on application.

All applications for each position will be treated in complete confidence. Those really qualified will be promptly advised of interview arrangements.

In each instance, appropriate employees have been advised of these openings.

The organizations involved are growing at a rate much faster than the average for the industries. The opportunity to combine "workability" with "livability" is unusual at the proposed locations.

P 5699 Electrical World
330 W. 42 St., New York 36, N. Y.



for interrupting high voltage circuits in air without external arcing or contact burning..

3E AIR INTERRUPTER SWITCHES

Loads up to 600 amperes at 15,000 volts can be opened with these 3E switches. Magnetizing currents of transformers and charging currents of lines and cables are also efficiently interrupted.

Switches are available for hook stick or group operation in either open or enclosed styles... and can be supplied in combination with power fuses for economical overload and short circuit protection.

For full details write for Booklet

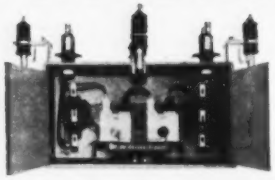
THREE G

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

SUPERIOR SWITCHBOARD AND DEVICES · SERVING THE COUNTRY'S LEADING UTILITIES ·

Check with Superior on

"IT" Enclosures



Full range of sizes in standard and top bushing types —all built to Superior's usual high quality. Write to:

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company

EEI T&D Meeting

(Continued from page 83)

the tests showed 2% or less unbalance. Open-delta transformer service averaged more than twice the voltage unbalance of delta connected.

Clark Denison reported that installation of 43,000 kva of time clock controlled switched capacitors on the Oklahoma Gas & Electric Co system in 1951-52 reduced loading on many feeders by a full year's growth. System losses were reduced upwards of 0.1 kw for each kvar of capacitors during peak load.

Transformer Standardization . . . Standardization of underground and network transformers is near, reported M. W. Ghen, EEI chairman of the joint committee. Secondary voltage will be 216-125 and the impedance 4 to 5%. Welded covers with gasketted hand-holes will be specified for underground distribution transformers.

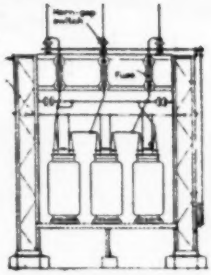
Network protector ratings based on transformer kva was urged by T. C. Duncan, Consolidated Edison Co. He suggested that the protector be capable of carrying 130% of the transformer nameplate rating at 35 C ambient.

Panel discussion revealed general acceptance of ASA Standard C57 as the basis for emergency loading of network transformers. The design limit ranges from 130% of nameplate in northern cities to 120% in the south.

Feeder Outages . . . Nearly 500 cases of simultaneous loss of two network feeders in five years were reported for one system designed for such contingencies. Scheduled feeder outages are minimized during heavy load periods in critical areas, however, to avoid load curtailment in case of an additional feeder failure. Other network operators face load curtailment for a second feeder outage, permit no scheduled outages during heavy load periods.

Inability to pick-up total network load after shutdown has forced many large networks to be divided into smaller areas separately supplied. T. C. Duncan cited substation control battery capacity as determining the number of feeder circuit breakers which could be closed within the allowable time for network pick-up. Future use of network supply sub-

MEMCO (SINCE 1915)



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stations switched at transmission voltage was suggested by D. K. Blake, General Electric Co.

Utility Accidents . . . The electric utility accident rate is greater than the average of all industries, and the severity much greater, panel members noted in reviewing methods employed to reduce electrical contact cases on distribution circuits. Particularly important, they agreed, is the willingness of linemen to accept without reservation and to comply rigorously with safe working procedures. Few accidents can be attributed to failure of gloves or hot-line tools, but close attention was urged to detect internal cracking of rubber gloves. Cases were cited where cracked gloves had withstood dielectric tests but proved defective on air pressure testing.

Though Techachapi's earthquake last July was severe, a bad storm would have caused more utility damage, R. N. Coe, Southern California Edison Co, said. Most service was restored in a few hours.

Storm's Handiwork

R. E. Ward, newly elected president of the southern section of International Association of Electrical Inspectors, displays a freakish piece of handiwork fashioned by a tornado which lashed Henderson, Tenn., earlier this year. The cable he is holding was a four ft section of a 13-kv transmission line—No. 2 steel-reinforced aluminum cable made up of several aluminum wires wound around a steel core. The core withstood the tornado's blasts but the aluminum strands folded up like hairpins to form an intricate, almost perfect, design.

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Street Lighting

(*Continued from page* 104)

guidance functions, in effect nearly extinguishing the lights!

In the absence of a clear understanding of what was occurring, many responsible street lighting application engineers among both manufacturers and utilities permitted the early helmet type reflectors to be mis-applied in great numbers.

The complaints of the public were systematically discounted and processes of "education" were urged to reconcile the users to the shielded reflectors. It was soon found impossible to sell this dangerous lighting generally to the public and users were forced to adopt various expedients to regain tolerable lighting performance. Some users lowered the lamp sockets until the filaments became visible. Others used lamps of longer light center to obtain the same result. Helmet reflectors were removed from entire towns in some cases, and radial wave units were restored.

Improved Type of Unit Appears . . . Early in 1950 and in recognition of the foregoing unhappy experience, a new helmet reflector was introduced in which the principle of shielding the lamp filament by obscuration was abandoned in favor of the different principle of shielding by background brightness.

This new type of reflector retained the oval shape, but was designed with the lamp filament visible below the horizontal plane in the street direction, retaining both beacon and guidance lighting effects where they were needed.

Auxiliary reflecting strips were attached to the lower interior surfaces of the main porcelain enamel reflector body. The light center is offset horizontally to provide the Type II light distribution, though it can be alternatively placed to give the Type I pattern.

The "edgeflectors" are stainless steel strips, polished to a high specular finish and chromium plated to obtain improved reflection factor. These have optically true vertical fluting to give full-width luminaire brightness when viewed from the street. Without curvatures in the vertical direction, variations in light center position cannot produce major ray trap-

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ping, making the design less critical as to light center.

For the very few locations requiring exceptional shielding, stainless steel end visors are available. Where dirt or breakage conditions are unusually severe, a transparent plastic cover guard formed into a plain domed contour is readily attachable to the lower flange of the reflector. The appearance of the reflector plus cover guard is strikingly modern and aesthetically appealing. The reflector is optionally provided with any of the standard necks commonly used for street lighting.

A shadow pattern of the new unit shows the projection of the reflector rim from the bare filament only on the surrounding ground surface. This is not a cp curve. With a 1,000-lumen, 6.6-amp series lamp, the entire filament is visible to a distance of 16 times the mounting height. At least one-half the filament is visible at this distance throughout a horizontal angle of 75 deg in both roadway directions, providing coverage for very winding roads.

The reflector with edgeflectors shows 76.5% efficiency, and without these, 83.5%, all in the lower hemisphere. On a 45-ft roadway, with the luminaire 6 ft out from the curb and 20-ft mounting height, the utilization factors are 43.5 and 48% respectively. The large reflector keeps average brightness down to 35 cp per sq in. (with 2,500-lumen lamps). Performance has been widely observed and is generally appraised as giving an exceptionally high degree of visibility with minimum glare. The high angle of maximum cp (77.5 degrees) plus partial exposure of the filament in the horizontal plane toward the roadway give results as satisfactory for long spacings as the radial wave unit and remarkably improved service at intermediate distances. The shadow pattern that is obtained on abutting dwellings affords a most satisfactory compromise between front walk illumination and sleeping room lighting conditions.

Improved Type II units should not replace radial waves if the pole bracket is below Code height. Relocation expense can be saved by installing the former without edgeflectors at any existing low elevation. When the pole is later replaced on normal maintenance, the unit can be raised and edgeflectors attached by installing push rivets and washers.

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How PROSPEROUS Is The USA?

Just how prosperous *are* the people of the United States?

The sole purpose of this message is to help clear up the confusion and controversy that surrounds this important question.

To find out how much prosperity, or material well-being, the people of the United States now enjoy, it is necessary to get answers to these questions:

1. As compared with other times, what is the total amount of goods and services that we have available for our enjoyment?

2. How great, on the average, is the share of each American in this prosperity?

3. How does our prosperity compare with that of other nations?

National Product at Peak

The government statisticians who do the bookkeeping for the nation produce a figure called the Gross National Product. It is supposed to be the total obtained when you multiply the amounts of everything we produce by the prices of everything produced. This year the GNP, as it is commonly tagged, will add up to something like $345 billion.

Since this will be the highest total that GNP has ever attained, some people will acclaim it as evidence that we now are enjoying the greatest prosperity on record.

The GNP, however, is not an accurate yardstick of prosperity. It may go up because of price inflation alone without any increase at all in the output of goods and services. Also the GNP includes very large amounts of goods and services, such as those for the military, which are in fact a result of misfortune rather than of a condition that might properly be called prosperity. Moreover, there is no deduction from the GNP to make allowance for the equipment that is worn out in producing it.

Little Recent Progress

When we make adjustments such as these – to find out how much of our production really is available for the use and enjoyment of the civilian population – the *adjusted* national product since the beginning of World War II comes out about as follows. The effects of price inflation have been removed from these figures.

YEAR	ADJUSTED NATIONAL PRODUCT	
	Billions 1951 Dollars	Index (1946 = 100)
1940	$176.2	76
1946	232.5	100
1947	240.7	104
1948	244.3	105
1949	239.7	103
1950	260.9	112
1951	267.9	115
1952	264.3	114

From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made came in a few dramatic increases before or after a military build-up. Aside from those, the progress has been fairly slow. This year, 1952, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them.

YEAR	POPULATION Millions	ADJUSTED NATIONAL PRODUCT Billions 1951 Dollars	ADJUSTED NATIONAL PRODUCT Per Person
1940	132.0	$176.2	$1,335
1946	141.3	232.5	1,645
1947	144.0	240.7	1,672
1948	146.6	244.3	1,666
1949	149.2	239.7	1,607
1950	150.6	260.9	1,732
1951	154.4	267.9	1,735
1952	156.9	264.3	1,685

Here it is clear that we have made little or no headway since the end of World War II.

U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States	$1,735
Canada	1,231
United Kingdom	614
France	510

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various income classes and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

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CATALOGS • BULLETINS

• **MICROWAVE COMPONENTS:** Titeflex, Inc, 500 Frelinghuysen Avenue, Newark, N. J. announces a new twelve page catalog describing its line of microwave components. This booklet includes detailed specifications for both rigid and flexible waveguides plus schematic diagrams and application charts. Titeflex pioneered both design and development of flexible waveguides during World War II in conjunction with the Army and Navy Departments. All Titeflex microwave components meet JAN specifications and each customer's specific requirements before shipment. For further information contact the company.

• **UNISTRUT POCKET CATALOG:** A new pocket size catalog designed for use by the worker on the job and as a handy reference guide for the architect, engineer, draftsman, contractor or builders, is now being distributed by Unistrut Products Company, 1013 W Washington Blvd, Chicago 7, Ill. It contains 84 pages of ideas, photographs, drawings and data on how to frame, hang, mount and support all kinds of mechanical and electrical equipment with adjustable Unistrut all-purpose metal framing. Included are useful reference tables, graphical symbols and data covering weights and dimensions, warehouse and distributor locations, and complete ordering information.

• **FLEXIBLE TUBING LINE:** A complete line of flexible tubing, in diameters from less than 1 to 30 in, is described in a new 4-page bulletin available from Flexible Tubing Corporation, Guilford, Conn. The ducting, made of fabric supported rubber or plastic wound on helical spring wire coils, is lightweight, highly retractable, non-collapsible, non-kinkable, flexible enough to allow up to 180° turns, and requires no installation skill. Uses of the tubing include portable and semi-permanent ventilation service, fume removal, dust collection, and materials handling, in original equipment designs and maintenance applications. Catalog C2-3 also includes information on tubing for special applications, and on fittings.

• **RADIAL-FLOW SURFACE CONDENSERS:** A new 32-page booklet titled "Radial-Flow Surface Condensers" is now available for distribution. Opening with an explanation of what the radial-flow design is, the booklet lists a number of its features. Color diagrams illustrate heat transfer, surface activity, and deaeration of condensate. Shop photographs show the type of shell construction, the way in which tube supports and tube plates are installed, tube rolling and packing, provision for differential expansion, and shell connections. For a copy of this booklet, B-4350, contact your local Westinghouse representative or write Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.

• **SUPER CYCLONE FURNACES:** A new 8-page two-color bulletin on gas-fired and electric super cyclone furnaces has just recently been issued. The bulletin contains photographs, diagrams and specification charts on all types of Lindberg super cyclones. Operation, design features and the wide range of uses for annealing, normalizing, tempering, nitriding and special heating are briefly explained. Request your copy of Bulletin No 131 from Lindberg Engineering Company, 2450 West Hubbard Street, Chicago 12, Ill.

• **COMPRESSORS:** An 8-page descriptive bulletin on hermetically-sealed refrigeration compressors and condensing units of 75 to 100 hp capacity is now available. This well illustrated bulletin gives an explanation of CLS compressors and condensing units: the motors, valves, pistons, crank shaft, bearings, and other smaller parts are discussed with respect to the manufacturing methods used to make them of better quality and higher serviceability. In addition, lists of available accessories for condensing units are given. For a copy of this bulletin, DB 101-140, write Westinghouse Sturtevant Division, 200 Readville Street, Hyde Park, Boston 36, Mass.

• **TEMPERATURE RECORDER:** Bulletin 447, just issued by The Foxboro Company, Foxboro, Mass. manufacturers of industrial instruments for the measurement and control of process variables, contains complete details of temperature recorder construction, showing how each component part, from bulb to chart, contributes to recorder accuracy. Its 20 pages provide factual information, assisting in the understanding, selection and use of temperature measuring instruments. A brief description of indicating and controlling temperature instruments is also included in the new publication, copies of which will be sent on request.

• **TACHOMETERS:** A new bulletin describing its full line of recording and indicating electric tachometers has just been published by The Bristol Company, Waterbury, Conn. The instruments described include models for measuring speed of rotation or travel, processing time, speed ratios, sum or difference of speeds, and average of speeds. Featured in the bulletin are the recently-announced electronic dynamaster recording tachometers. Engineering information and complete specifications on magnetos and the various types of magneto drives are given. The 20-page bulletin, No. S1402 is illustrated with photos and drawings showing methods of application, reproductions of actual chart records, and dimensions. Copies of the bulletin are now available.

• **DISTRIBUTOR CATALOG:** 476 new items are covered in a new industrial and distributor stock catalog No. 28. The book has been increased from 28 to 32 pages and covers five product divisions: variable resistors, ceramic capacitors, rotary and lever switches, printed electronic circuits, and steatite insulators. The attractive, fully illustrated and indexed catalog is available free of charge from any Centralab distributor, or by writing Centralab at 900 East Keefe Avenue, Milwaukee 1, Wisconsin.

• **AIR CYLINDERS:** The new Bulletin #731 describes the complete line of Air Cylinders manufactured by the Lindberg Engineering Company. Diagrams, charts and photographs explain the capacity and type of mounting of Lindberg Air Cylinders a listing of engineering features is included. Request this informative reference book from Lindberg Engineering Company, 2450 West Hubbard Street, Chicago 12, Illinois.

• **WATTHOUR METERS:** A new display brochure, made available by Sangano Electric Company, Springfield, Ill. explains the important influence of modern metering on the revenue of the electric power industry. Illustrated with photographs, the 20-page brochure tells the story of modern watthour meters, how they are made and how they serve the power company's interests most effectively while assuring good public relations through sustained accuracy, facilitating fair pricing, reducing operating costs, saving maintenance expense.

• **REFERENCE CATALOG:** Publication of a 16-page, illustrated quick reference catalog, describing flexible metal hose and tubing, has been announced by the manufacturers. These products are made in two basic types: seamless and strip wound. The catalog shows wide range of available alloys and sizes, suggested applications, furnishes data on hose and fittings, and also includes engineering information. Available free of charge. Ask for Catalog CC-400, The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.

BOOK REVIEWS

Electronics

***Fundamentals of Engineering Electronics*, second edition.** By William G. Dow. Published by John Wiley & Sons, Inc, New York. 627 pages, illustrated. Price $8.50.

This revised edition follows the meter-kilogram-second system of units throughout, in accordance with accepted engineering practice. The analysis of the behavior of space-charge control tubes has been modernized by using the "equivalent grid plane potential" and "equivalent electrostatic circuit" concepts.

Also included are a statement of the basic principles for electron tube design in uhf and microwave ranges, and the energy level behavior of electrons in semiconductors with reference to the Fermi distribution and level. Also the book includes an analytic treatment of the dependence of interelectrode capacitances on space-charge control tube geometry.

The book is intended to provide students of electron circuit and electron tube engineering with an understanding of internal functioning in electron devices. This book will also serve as a reference book for engineers and all those who are working in these fields.

Communication

Electrical Fundamentals of Communication. By A. L. Albert. Published by McGraw-Hill Book Co, New York 36. 531 pages, illustrated. Price $7.

In the second edition of this book (the first was printed in 1942) there is added emphasis on the fundamentals of radio because of the increased dependence on this mode of communication. The symbols throughout as well as definitions have been realined with AIEE and IRE standards.

Preferred Numbers

Zauberwelt der Normzahlen. By W. Strahringer. Published by Verlag der Electrizitatswerke, Frankfurt am Main. 95 pages, illustrated. Price $6.50 DM.

This electrical engineering author sets himself the task of explaining preferred numbers and then using them simply, conveniently and effectively. The samples he chooses for discussion of practical application are chosen largely from the electrical field and they embrace such items as load curves, per capita consumption, rates for electricity (and for wages as well), appliance pricing. The author is so sure he makes the technique simple and straight forward as to warrant the titling of the brochure, "Fairyland of Norm-numbers."

Television Engineering

Television. By F. Kerkhof and W. Werner. Published by Elsevier Press, Inc, Houston 6, Texas. 475 pages. Price $7.75.

This book, an English translation of the Dutch original, is a recent addition to the Philips Technical Library which includes a series of nine books on electronic tubes. Its general purpose is to explain the circuits of television receivers, with incidental reference to studio and transmitting equipment. The physical principles of television are stressed, to enable readers to understand new circuits as they are developed. Considerable mathematics are employed, although extensive mathematical skill is not essential to study of the book.

Numerous photographs and diagrams illustrate the principles discussed. Prepared from training material for television technicians, this book requires a good background in radio or electronics for effective assimilation. It would be helpful to electric utility engineers concerned with power plant television supervisory equipment or television interference investigations.

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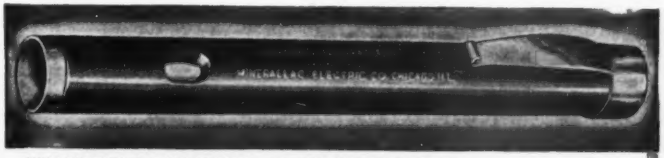

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3	200	West.	45000—2400/7200
4	150	West.	44000/33000—2300/6900
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
4	5000	G. E.	40935/70900 Y—14500
3	5000	G. E.	38100/66000—6600
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4	750	G. E.	11000—440 **
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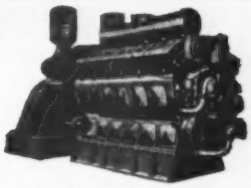

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750	General Motors	12-567	1080	720
600	General Motors	8-278A	750	720
300	General Motors	6-567	720	720
250	Baldwin	VO-6	510	450
220	Buckeye	80	480	600

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1	400	Westgh.	Non-Cond.—125/150 lbs., 5/10 lbs. B.P., 240/480-3-60
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1	1500	G.E.	360	275	2200/4400
3	1500	G.E.	514	250	6600/13200
1	1000	G.E.	900	260	4100/6900
3	1500	G.E.	900	600	2300/4150
2	1000	Whse.	900	600	2300/4158
1	800	Whse.	900	250	6600/13200
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	440
1	800	G.E.	720	125	2300
1	400	G.E.	720	250	440/2300
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1—100 KW G.E., 250V, 900 RPM, 2300V, Syn.
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8439 Steller Drive — Culver City, Calif.

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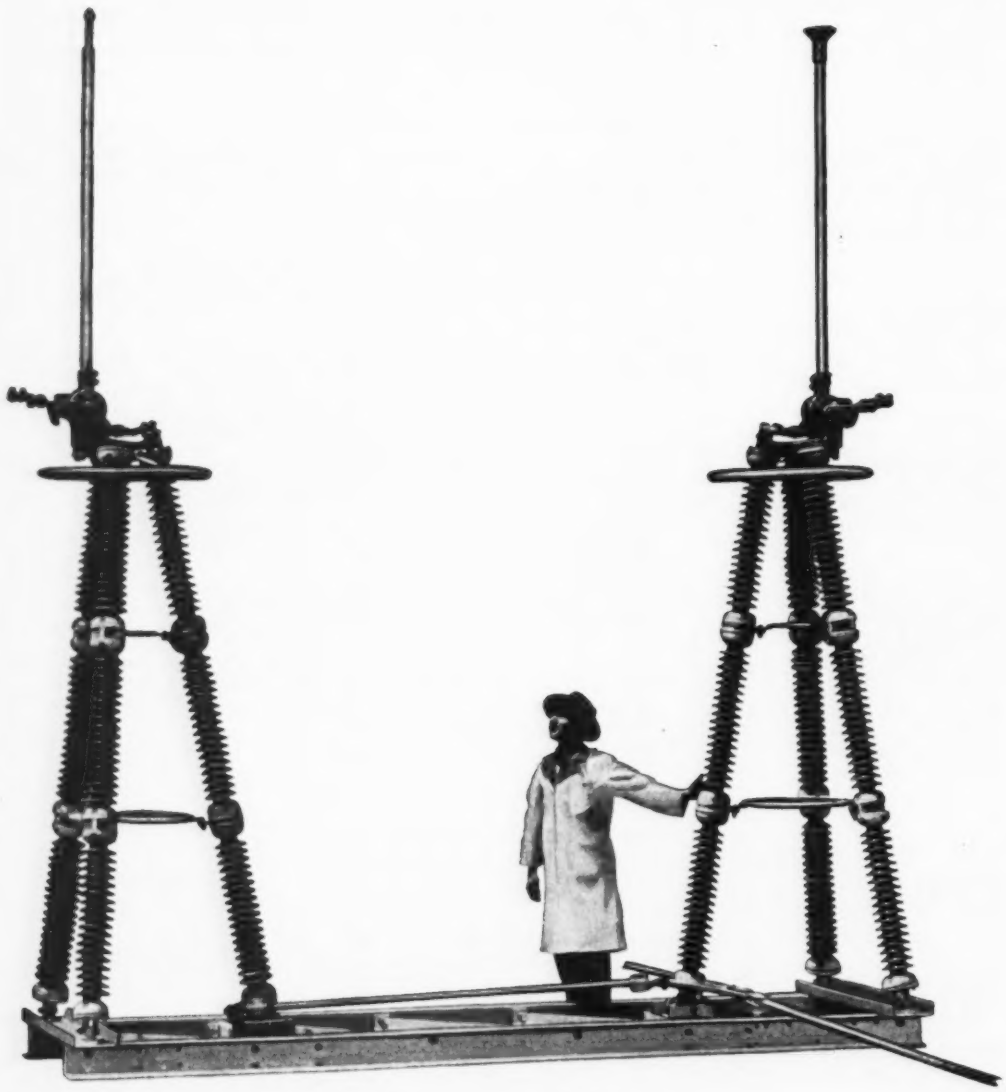

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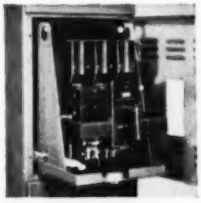
230,000 Volts—1200 Amperes—Type MV
Vertical Break—Three Pole, Single Throw
SILVER TO SILVER CONTACTS
Group Operated
(One pole shown)

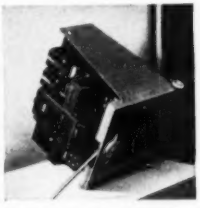
For compact, pre-assembled units...safe, easy operation...

SPECIFY

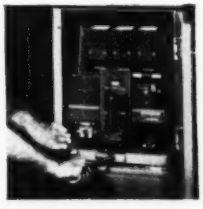
FEDERAL NOARK® DRAWOUT SWITCHGEAR



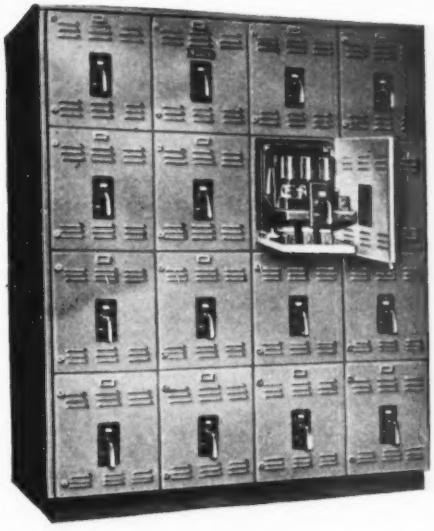
1—Breaker element of Drawout Switchgear on its self-supporting chassis.



2—Side view showing rollers and bottom mechanism that forces movable contacts into the stationary contacts.



3—Breaker elements are levered in and out of the "latched in" position by a rotary lever arrangement.



YOU'LL SAVE space, time and expense... and always assure accurate alignment and performance with Federal Noark Drawout Switchgear. These compact, factory-assembled units have every design feature that makes for safe, dependable operation and maximum life.

In the Federal Noark Drawout Switchgear the breaker elements consist of a self-supporting chassis with rollers that travel in compartment channels. A special triangle shift principle accurately aligns the contacts as they approach the "latch in" or "operating" positions. For safe and positive operation, a mechanical interlock permits breaker to be closed only when latched into the "all in," "test" and "all out" positions. Both the stationary and movable contacts are heavily silverplated, and the movable contacts are spring reinforced for extremely high efficiency.

Drawout Switchgear breaker elements are levered in and out of the "latched in" position by a special built-in rotary lever arrangement. Operating lever is a straight rod type. No wrenches or other tools are needed.

For any specific application, write for full information on the Federal Noark Drawout Switchgear.

Federal Electric Products Company, 50 Paris St., Newark 5, New Jersey.

FEDERAL NOARK®

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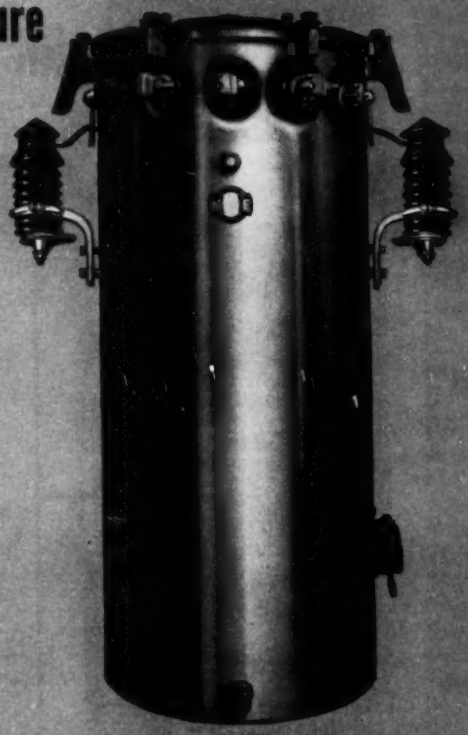
TRANSFORMER OPERATORS' QUIZ:

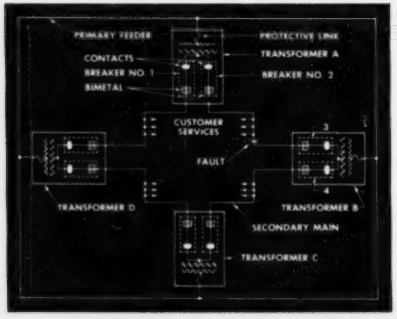
How do KUHLMAN CSPB® transformers protect equipment and assure uninterrupted service?



In high load areas, distribution transformers are often banked with both primaries and secondaries connected in a closed loop with "built in" circuit breakers. This arrangement provides two main advantages. It protects equipment against excessive surge voltages and the concentrations of power at fault points; and it assures uninterrupted customer service by permitting transformers in the bank to "gang up" to supply power to any point where there is an increased demand.

You get these advantages when you use Kuhlman CSPB banked transformers: (1) rapid fault location with a minimum load loss and service interruption, (2) reduced voltage drop due to low effective impedance of paralleled transformers, (3) reduced flicker caused by suddenly applied loads, (4) short-time overloads carried safely, because of the thermal loading provided by secondary breakers, (5) isolation of faulty transformers by primary protective link and secondary breaker, and (6) all protective devices included in one single installation, eliminating crossarm accessories.

Here's how it works . . .



Assuming a fault occurs at X in the diagram, the Kuhlman CSPB transformer bank operates as follows:

1. The fault draws current from the transformers in inverse proportion to the total impedance of each transformer.

2. Transformers A and B, being adjacent to the fault, supply the bulk of the fault current. This current combines with the fault current from transformers C and D, flowing through the bimetals of breakers 2 and 3.

3. At the same time, the fault currents from C and D oppose the load currents in breakers 1 and 4, causing breakers 2 and 3 to open and isolate the faulted section.

4. With the faulted section isolated, transformers A and B will continue to furnish their former share of the load through breakers 1 and 4 to the remaining network.

5. A red signal automatically lights on the transformer connected to the faulted circuit, in this case transformer B.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

Write for descriptive bulletins on Kuhlman Power, Distribution, Dry Type, Sel-T-Kuhl, and specialty units. For details of CSPB transformers, ask for Bulletin CS-302.

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